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LAUNCH OF THE FIRST 500-FOOTER.

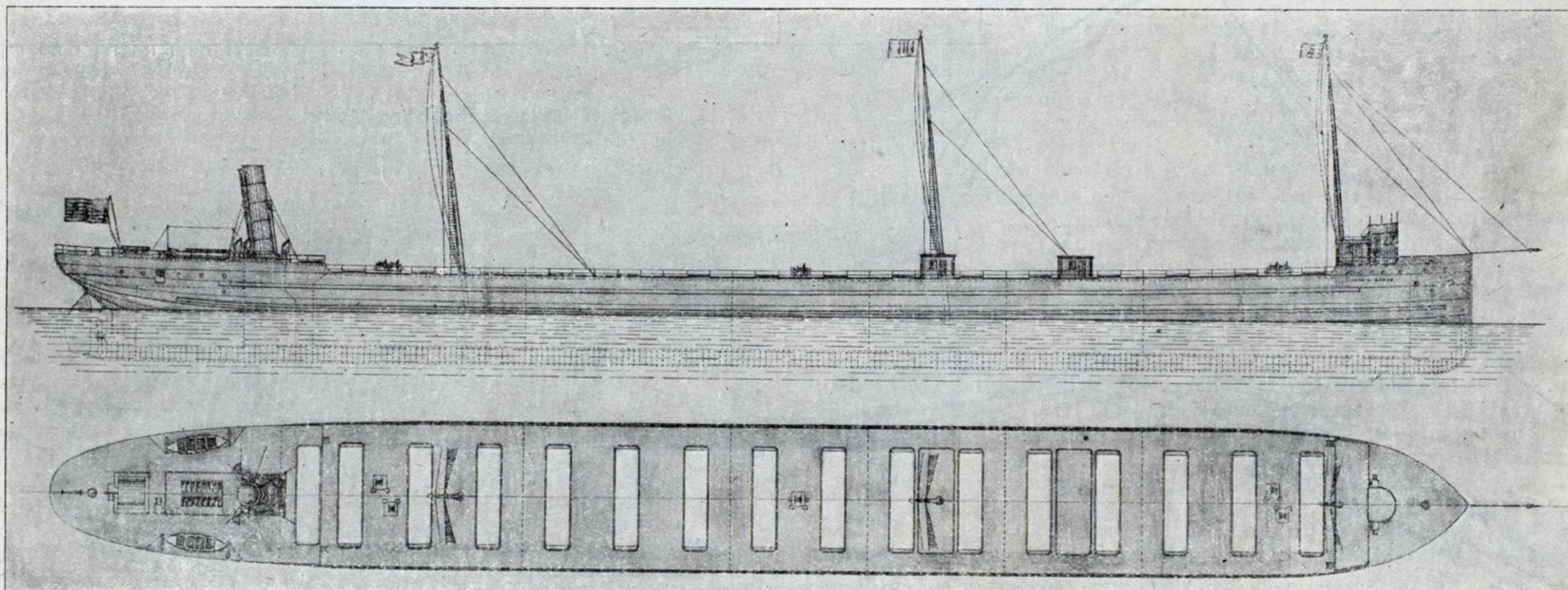
The first 500-foot freighter for service on the great lakes was launched at the Lorain ship yard of the American Ship Building Co. on Saturday last, and General Manager James C. Wallace was favored with a very distinguished company at a sumptuous repast that followed the launching. The guests included President John W. Gates and other leading officers of the American Steel & Wire Co., as well as Mrs. Gates, who christened the steamer. A large party of officers of the ship building company, as well as some of the vessel owners, who were in attendance at the Detroit meeting of the Lake Carriers' Association, also visited Cleveland so as to join in the launching ceremony. This steamer is the first of four big carriers building for the American Steamship Co. (controlled by American Steel & Wire interests) and which will each carry about 9,000 net tons per trip. The second of them, to be named for James J. Hill of the Great Northern R'y, will be launched in a couple of weeks.

The Gates is a steel, bulk freight steamer and is within a few inches of 500 feet over all. The length on keel is 478 feet, beam molded 52 feet, and depth 30 feet. Steel is used for masts, deck houses, and in fact in almost every part of the vessel, wood being dispensed with whenever possible. The Gates has thirteen water-tight compartments and has a capacity for 3,500 tons of water ballast. There are five longitudinal girders on each side of the center line of the hull. The between-deck beams are spaced 8 feet apart throughout the length of the cargo holds, and consist of 15-inch heavy channels attached to 15-inch channel bent frames, similarly spaced, and these in connection with spar deck beams and channel floors, make a succession of continuous heavy members 8 feet apart throughout the length of the ship. These in turn are strongly con-

NEW GRAIN ELEVATORS.

The Barnett & Record Co., 541 the Rookery, Chicago, has practically completed all arrangements for beginning work on the first of the grain elevators at Montreal that is to be operated by the Conners' syndicate. The actual work will begin within the next few days, as the contract calls for the completion of the structure within five months. This first plant will consist of a main building and one or two annexes. The main structure will have a capacity of 1,000,000 bushels, while the annexes will provide storage for at least 2,000,000 bushels additional. Steel, concrete and wood will be the principal materials used. The bins, which will be of concrete, will be of the Pierre Monier type, of which E. Lee Heidenreich of Chicago is the American representative. The buildings will be as near fire-proof as possible, and the entire plant when completed will cost about \$700,000. It is expected that it will be ready for use about November next.

As readers of the Review know, the improvements recently made on the Calumet river at South Chicago are such as to insure the location of some of the principal elevators on that stream in the future. One of these, building for McReynolds & Co., and situated at One Hundred and Sixth street and the Calumet river, is now nearing completion. It has a storage capacity of 1,500,000 bushels. On the river at Ninety-Eighth street W. H. Merritt & Co. are also building an elevator, the capacity of which will be 500,000 bushels. Both structures are of the latest type and provided with every improvement. They will be completed within about six weeks or two months. The McReynolds elevator is 251 feet in length, 119 feet in width and 117 feet in height. Under pressure it will be possible to unload 400 cars of grain every twenty-four



STEAMER JOHN W. GATES—FIRST 500-FOOT FREIGHTER FOR THE GREAT LAKES.

nected and braced longitudinally by stringers and girders, making the ship exceptionally strong. There are fifteen cargo hatches, 30 by 8 feet in the clear, spaced 24 feet centers. The cargo holds are divided into six compartments by water-tight bulkheads and steel doors. The vessel will be fitted with a quadruple expansion engine, with cylinders of 16½, 25½, 38½ and 60 inches in diameter and 40 inches stroke. These engines will drive a wheel 14 feet in diameter and 15½ feet pitch. Steam will be supplied from Babcock & Wilcox water tube boilers having 140 square feet of grate surface, 6,800 square feet of heating surface and working at 250 pounds pressure. The boilers are fitted with Learmonth purifiers. Crowe patent furnace and a forced draft system. The coal bunkers will have a capacity of 300 tons. The auxiliaries include Globe steam steering gear, Globe steam capstan windlass, American Ship Building Company's winding machines for handling wire mooring lines, International company's anchors and a complete electric light plant, operated by compound engines. The Gates will have three steel pole masts, with pilot house and Texas adjoining the forecastle, and a raised quarterdeck over machinery and boiler space. The chart house and pilot house, as well as captain's quarters, one stateroom and rooms for mates, wheelmen, watchmen, firemen, deckhands, etc., will all be in the upper forward part of the vessel. Two deckhouses amidships will be devoted entirely to passengers. Quarters for engineers, oilers, steward, as well as engineers' storerooms, kitchen, crew's mess rooms, dining room, etc., will be situated below the quarterdeck aft.

The Gates will be commanded by Capt. Ralph Lyons, who has been at the head of the list of captains in the Wolvin fleet for a long time past, and Andrew Haas will be chief engineer.

Writing of hemp supply and prices in the last issue of the Review, Mr. H. F. Lyman of the Upson-Walton Co., Cleveland, said that "the first 100,000 bales or more shipped after the Manila hemp ports are opened must be that already sold, so that it will be July or August before any hemp arrives that is now unsold." In type the figures were 10,000 bales instead of 100,000 bales as written by Mr. Lyman.

hours. The lower portion of the building will be of steel, and the bins and upper part of wood. The elevators now on the Calumet river have a capacity of between 12,000,000 and 15,000,000 bushels, and those on the Chicago river have an aggregate capacity of probably 50,000,000 bushels.

A STRONG LETTER FROM THE TRIGG COMPANY.

Washington, D. C., Jan. 24.—The house committee on merchant marine and fisheries, in its consideration of the measure generally known as the shipping bill or subsidy bill, has requested for its use as soon as practicable a statement from the bureau of navigation, treasury department, showing: First, the ship building establishments on the seaboard of the United States in which steel vessels are built; second, the number of men employed in each establishment; third, the capital invested; fourth, a list of the steel merchant vessels now being constructed at each establishment, showing gross tonnage (speed, if practicable), and for whom building. This information, which will undoubtedly be very carefully compiled by the commissioner of navigation, Mr. E. T. Chamberlain, should prove very interesting. One of the first answers to this inquiry is from Mr. L. T. Myers, vice-president of the Wm. R. Trigg Co., Richmond, Va., who says:

"We now employ 700 men in the construction of steel vessels, and we are building war vessels only, having now under way six for the United States navy. Encouraged by the prospect of the shipping or subsidy law, we have under consideration the enlargement of our plant, so as to treble its present capacity. Our board of directors believes that with proper subsidy, the increase in ship building in this country will be enormous, and this company desires to be in position to reap some of the benefits. If the subsidy bill passes, we shall expect to reorganize the company on a capital of \$2,000,000 and give employment to 3,000 men."

Members of the Lake Superior Mining Institute will give special attention at their annual meeting this year to properties on the Menominee range of Michigan. The meetings will begin at Iron Mountain, Mich., Feb. 6.

LEVELS OF THE LAKES.

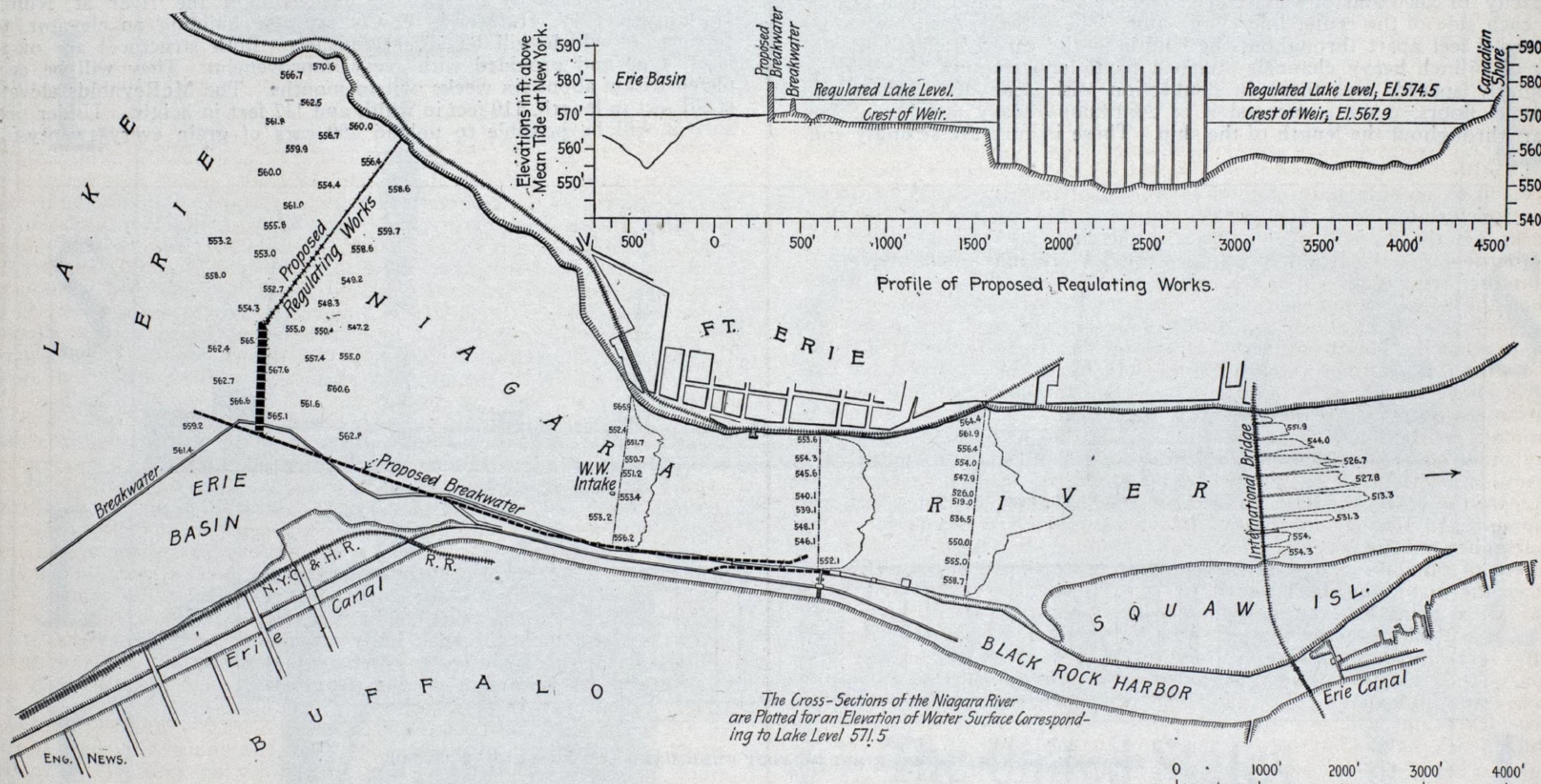
A VERY INTERESTING DISCUSSION OF THE NIAGARA RIVER DAM PROJECT—
WOULD BE THE MOST STUPENDOUS PHYSICAL EFFORT EVER
PRODUCED BY MAN'S ENERGY.

A carefully-prepared editorial in a recent issue of the Engineering News of New York, discusses in a very interesting manner the proposition to establish and control by artificial means the water levels of Lakes Erie, Huron and Michigan, covering 60,000 square miles with their connecting waterways. This would be, without doubt, the most stupendous physical effort ever produced by man's agency. And yet it is seriously proposed to accomplish such a task, detailed plans having been prepared by the United States Board of Engineers on Deep Waterways. A full summary of the report of these engineers appeared in the Marine Review of Dec. 21, 1899, but the editorial in the Engineering News puts the subject in such a light as to be worthy of reproduction. It is as follows:

"To regulate the level of these lakes in the manner proposed, by a dam in Niagara river, presents one of the most promising solutions of the problem of securing improved lake navigation which has ever been brought forward. Wider, straighter and deeper channels for harbors and through the lake waterways are urgently demanded by the increasing shipping interest. No plan which has been presented for securing these improvements offers so great a benefit for so small an expenditure as regulation. The control of the levels of the great lakes is an international matter, and of course will require international consideration and agreement to accomplish, but there appears to be no good reason why this phase of the question should not be arranged satisfactorily, if it is properly undertaken. So far as at present appears, Canada has everything to

these waters is directly regulated by the depths of their harbors and of the waterways connecting the several lakes. For a number of years work has been in progress by the United States on the deepening of the lake channels to 21 feet. So far this improvement has not been extended to the lake harbors, except in isolated instances, and until this is done lake transportation interests can gain little benefit from the deepened channels. Obviously any increase in the height of the water levels which can be brought about by regulation reduces by that much the amount of future deepening required to be done. The depth gained in this manner, moreover, benefits the harbors and the connecting waterways equally. In some respects this appears to us to be one of the strongest arguments in favor of regulation. To obtain a rough idea of what this one item of saving in excavation may amount to, let us make a short calculation. According to the figures given by the board, the plan of regulation proposed will raise the level of Lake Erie about 3 feet higher than the usual stage of water during the low water period in the latter part of the season of navigation. The aggregate cost of improving Lake Erie harbors has averaged up to the present time in round numbers \$1,000,000 for each foot of permanent depth secured. It is evident, therefore, that to obtain the same results by excavation as it is claimed will be afforded by the plan of regulation which is proposed, would cost fully \$3,000,000. The entire cost of the regulating works is estimated by the board at \$800,000 in round figures. Making all due allowances for errors in these estimates, the saving shown is remarkable enough to justify the most thoughtful consideration of any feasible plan for raising the levels of Lake Erie, it will become plain that this is only one of the possible opportunities for a similar saving.

"It is pointed out in the report of the deep waterways board that the further deepening of the Detroit river shoals seems imperatively necessary in the immediate future. At present there is less than 18 feet depth over them at low water. It is maintained by the board that not only a



MAP AND CROSS-SECTION SHOWING LOCATION AND CHARACTER OF PROPOSED CONTROLLING WORKS IN THE NIAGARA RIVER FOR REGULATING THE LEVEL OF LAKE ERIE.

gain and nothing to lose by the proposed work, and even though she may not contribute toward its cost, no reason appears why she should not give to it her hearty consent and approval. A careful study of plans of the deep waterways board will demonstrate that the proposed regulation can be carried out by methods entirely within the precedents of modern engineering, and at a cost which will be moderate in comparison with the benefits to be secured. At the very least estimate the evidence which the board presents must be regarded as a noteworthy endeavor to solve an engineering problem of vast commercial importance, and for that reason, if for no other, it deserves the careful consideration of engineers.

"The proposition to control the water levels of the great lakes by artificial means is not new. In one form or another it has for a number of years attracted the attention of engineers familiar with the hydraulics of these great fresh water seas. The first definite plan for carrying it out was, we believe, outlined by Mr. George Y. Wisner, M. Am. Soc. C. E., in a paper read at the Toronto meeting of the International Deep Waterways Association, in the fall of 1894. Mr. Wisner's plan was substantially the plan which is now advocated by the United States Board of Engineers on Deep Waterways. In 1895 Mr. L. E. Cooley suggested damming the Niagara river, or preferably the St. Mary's river, at the outlet of Lake Superior, as a means of remedying any lowering of the lake levels by the opening of the Chicago drainage canal. It has several times been said in these columns that some plan of lake regulation presented not only an admirable solution of the problem under consideration, but would wipe out the present variation of the lake levels due to natural causes, and would hold them permanently at a point which would add substantially to the navigable depth of every harbor and channel on the lakes.

"The significance to the great lakes' shipping interests of this last result, if it can be obtained, is evident upon a moment's consideration of the factors controlling lake navigation. The size of the vessels plying on

deepening of this channel, but a substantial increase in its width is demanded by commerce, and figures are presented to show that the 2 feet increased height of this stream, which will result if Lake Erie is raised 3 feet, will save more than enough excavation to pay for the construction of regulating works. In this connection the report of the board brings out a fact which in some respects, we think, the most interesting natural phenomenon which its investigations have developed. Briefly stated, these examinations show that at the outlet of Lake Huron, the St. Clair river has been deepened by erosion in recent years over 18 feet. This has increased the cross-section of the river at this point over 20 per cent, and has resulted in lowering the surface of Lakes Huron and Michigan about one foot since 1886. Raising the levels of these lakes will restore this decrease. On the other hand, if the work of deepening and enlarging the Detroit river is continued, in the absence of works to retain the level of Lake Erie, there will be a still further lowering of Huron and Michigan.

"These facts, brought out by the board's report, evidently deserve careful attention in settling upon the best method of securing an improved channel between Lakes Huron and Erie. It is, however, from another direction that we believe the greatest benefits of raising the lake levels, as compared with dredging lake harbors and channels, are to be looked for. It is manifest upon the merest mention that one of the chief requisites of economical transportation on the great lakes is to have a constant depth during the entire season of navigation, so that vessels will be able to carry full cargoes at all times. Lake vessels are now generally constructed to utilize the maximum depth of the navigable channels. Under natural conditions these depths are subject to periodical fluctuations. Besides the local variations of level, due to temporary natural causes of short duration, such as wind effects, there is the larger annual fluctuation due to the seasonal low water. This means that vessels designed for maximum depths must sail short of full cargoes during a

greater or less portion of each season. Furthermore, as low water occurs in the fall, the decrease in carrying capacity takes place just when the rush of business closing the year's navigation makes full cargoes of the greatest importance. It is plain that deepening the lake channels cannot alter the annual decrease in depth to which they are subjected by the natural fluctuations in lake levels, and that the control of these fluctuations is the only thing which will remedy the condition.

"From what has been said the advantages to be secured by regulating the lake levels at a constant stage are sufficiently apparent, we think, to explain the interest which engineers have taken in the proposition. Evidently the next question to be decided is the feasibility of accomplishing the proposed regulation. This is the phase of the question which is discussed particularly in the report of the board. A very little thought makes it plain that this question involves problems which extend far beyond the mere structural task of building a dam which will control the outflow of the lake waters beyond a certain volume. These arise chiefly from the fact that any restraint set upon the normal conditions of flow in any of the lake waterways is certain to affect somewhat the regimen of at least the immediate waters which supply them, and which they feed. The hydraulic conditions of the various streams will, of course, determine how far-reaching this effect will be for any given amount of restriction. If it reaches the point where vested rights are disturbed, the benefits gained in one way may easily be overbalanced by the damage which will result in other ways. We hardly need to point out to engineers that interference with riparian rights is a thing to be avoided wherever possible; and in a case like the one under consideration, where the water lines which it is proposed to alter are partly within a foreign country, such interference is especially risky. These brief remarks are ample, we think, to show the wide range of the problems involved in any scheme for controlling the water levels of the great lakes and which have consequently had to be considered by the engineers of the deep waterways board.

"To summarize briefly the reasoning of the board's engineers, it will be observed that they assume at the outset that the fact that the evaporation from Lakes Huron and Michigan is at times largely in excess of the supply, establishes the impossibility of regulating those lakes directly. Since also the greatest discharge from Lake Superior occurs at the time when the two lower lakes are being lowered most rapidly by evaporation and outflow, it is reasoned that it would be a distinct injury instead of a benefit to alter the natural conditions by damming the St. Mary's river. The conclusion follows then that the only available location for regulating works is in the Niagara river. Observations made by the board show that the outflow of Lake Erie is practically equal to the maximum supply. If, therefore, regulating works are located at the foot of Lake Erie which, when the supply commences to decrease, will correspondingly diminish the outflow, the level will be maintained constant, and this is in substance what the board proposes. It will be seen from the board's report that what it is really proposed to do is to maintain the level of Lake Erie 3 feet above the normal stage of water during the latter part of the navigation season, which is the season of low water. In effect the plan is to maintain constant mean high water in this lake, but with the provision that any other stage of water may be substituted should conditions make it desirable. The result of this will be, according to the board's figures, to increase the corresponding low water depth in Lake St. Clair 2 feet, and that in Lake Huron and Lake Michigan 1 foot. Lake Superior is, of course, beyond the range of effect. As is pointed out above, however, the waters of this lake reach their high stage in September, so that it produces the maximum discharge into Lake Huron just at the time when that lake is being lowered most rapidly by evaporation and outflow.

"It will be observed that since it is proposed to raise only the low water levels of the three lakes affected by the dam, there will be no extension of their existing water lines beyond the horizon they attain during each year's high water. Riparian rights, therefore, will not be injured on these lakes, but will actually be benefited. The outflow of Lake Erie, which feeds Lake Ontario and the St. Lawrence river, will, of course, undergo some modification, due to the controlling works. From all appearances, however, there will result from this no measurable alteration in the levels of those waters. According to the figures which are presented by the board's engineers, there will be no change in the total annual discharge of the Niagara river, but its character will be altered to the extent that there will take place during the first half of the year an increase in the discharge amounting to 5 per cent of the total annual discharge, and a decrease of a similar amount during the last half of the year.

"It is a curious fact, worth noting at this point, that the measurements of the Niagara river, made by the board's engineers and confirmed by the last year's measurements of the United States engineers, show the discharge at the mean stage of Lake Erie to be about 220,000 cubic feet per second at the present time. The measurements made in 1890-91 by the United States engineers showed the discharge to be 230,000 cubic feet per second, and those made in 1867-9 gave it at 265,000 cubic feet per second. These figures indicate quite conclusively that there has been a gradual decrease in the volume of discharge of the river since 1867, and that it is apparently still continuing. Recent observations also bring out the fact that the discharge of the St. Mary's, St. Clair and St. Lawrence rivers exhibit about the same relative reduction from the volume shown by the determinations of 1867-9. It would be an interesting speculation to determine just what causes have been instrumental in bringing about these changes, and it is to be hoped that in its final report the engineers of the deep waterways board will endeavor to throw some light upon the matter."

"I am keeping in touch with the vessel interests," said Capt. W. W. Brown of Cleveland at the Lake Carriers' meeting, "for the reason that I still manage a couple of ships and have also found that aside from my dealings in stocks, bonds and securities of all kinds, my acquaintance with the vessel owners has brought me quite a number of trades in vessel property. I have, in fact, had to do with the sale or purchase of some twenty interests in vessels within the past few months, although I did not expect much on that score. The main part of my brokerage business as far as shipping lines are concerned has, of course, been in such stocks as American Ship Building Co. and Great Lakes Towing Co."

TO PROMOTE EFFICIENCY OF REVENUE CUTTER SERVICE.

Washington, D. C., Jan. 24.—Emphatic indeed is the report of the senate committee on commerce in its endorsement of the Frye bill to place the officers of the United States revenue cutter service upon practically the same footing as naval officers as regards salary, allowances and honors. This same measure was introduced by Senator Frye in the last session, but though warmly championed by him, did not come to a vote. An amendment was also inserted in the navy personnel bill containing practically the same provisions as the present measure, but at the first sign of opposition to it in the conference Mr. Frye consented to withdraw it rather than endanger the whole bill by letting it remain as an additional cause for argument at a time when the passage of the navy personnel bill looked doubtful. The measure is being regarded with such favor that it is probable that it will be passed during the present session.

The Frye bill provides that on and after its passage the commissioned officers of the revenue cutter service shall be as follows: Captains, first lieutenants, second lieutenants, third lieutenants, captain of engineers, chief engineers, first assistant engineers, second assistant engineers and constructor. In discussing the bill the committee on commerce says:

"Officers of the navy rank with officers of the army. Officers of the cutter service should of right and in fairness rank with both. They have earned by faithful service, devotion to duty, and heroic effort in peace and war, this right, and not to confer it would be an unjust discrimination against a valiant and devoted body of men who bear the commissions of the president by and with the consent of the senate, upon the same terms as do officers of the kindred service.

PAY OF OFFICERS OF THE ARMY, NAVY, AND REVENUE-CUTTER SERVICE,
RANK FOR RANK, AFTER TWENTY YEARS' SERVICE.

Army.		Navy.		Revenue-Cutter Service.	
Rank.	Pay.	Rank.	Pay.	Rank.	Pay.
Major.....	\$3,500	Lieutenant-commander.....	\$3,500	Captain.....	\$2,500
Captain	2,520	Lieutenant.....	2,520	1st lieutenant and chief engineer.....	1,800
First lieutenant.....	2,100	Lieutenant (junior).....	2,100	2nd lieutenant and 1st assistant engineer.....	1,500
Second lieutenant..	2,060	Ensign	2,060	3rd lieutenant and 2nd assistant engineer.....	1,200

"Attention is invited to the marked difference shown here between the pay of officers of the revenue cutter service and that of like or corresponding grades in the army and navy. Taking into consideration the arduous, often dangerous and always continuous work of the officers of the revenue cutter service, the disparity in pay is simply another discrimination against the service which cannot be reconciled with justice or fairness. The cutter service is required by law to aid not only in the protection of the revenue but to enforce nearly every statute affecting the maritime interests of the country. By acts of congress the service is required to aid in the suppression of piracy, in the enforcement of the quarantine laws, and in preventing the violation of the neutrality laws; to suppress mutinies on board merchant vessels and to use the armament of their ships and the force on board, when necessary, to bring vessels to for examination. The president may, by a single order, require the service, or any part of it, to co-operate with the navy when it at once becomes a part and parcel of the naval force of the country and passes from the jurisdiction of the treasury department to the control of the navy department. The service is therefore a part of the armed force of the country, identical in character with the naval service, and may at any time, in peace or in war, be made one by executive order. It is nothing, if not nautical, as its achievements upon the high seas, as well as upon the coast, for more than 100 years abundantly attest. That it is a military service is conclusively shown by its organization, the training and education of its officers, naval discipline, routine and the work it is constantly called upon to perform.

"The status of the revenue cutter service is that of a coast guard navy as the navy proper is an ocean navy. The one polices the coast and the other the ocean. There is no duty to perform by naval vessels in time of peace that cannot be and has not been performed by the vessels of the revenue cutter service, while in time of war they have taken part with the sister service. The seizure of smugglers and the prevention of illicit trade—the only duty of the service that has direct relation with the collection of customs—is precisely similar to the duty of naval officers in seizing vessels engaged in contraband trade in time of war. Other duties of the revenue cutter service, such as the enforcement of the neutrality laws, the suppression of piracy and of mutinies in merchant vessels, are now actually imposed on and performed by the navy in common with the cutter service. The committee earnestly recommend the passage of the bill."

LOSS OF THE CHARLESTON.

The navy department has received from Capt. G. W. Pigman, formerly commander of the United States cruiser Charleston, a report of the disaster which befell that vessel in the Philippines and a full account of which was published in the Marine Review a couple of weeks ago. The captain says in the course of his report: "The ship apparently struck on a spur ledge, about under the forward fire room, and in probably 15 minutes from the time of striking it was necessary to abandon the fire room, as the water was rising quite rapidly and had extinguished the fires, although the carpenter had reported no water in the double bottoms just before. In a very few minutes, perhaps five, the fires in the after fire room were extinguished by rising water and the boilers and engines were secured, all doors closed, and fire and engine rooms abandoned." In forwarding the report, Rear Adm'r Watson notes that the saving of every life together with arms, ammunition and rations reflects great credit on the captain, officers and men of the Charleston.

The board of naval construction at Washington has recommended that the steamer Badger, lately the Mumiri, be sold. The report of the inspectors shows that it will cost not less than \$25,000 to put the ship in condition for naval service, and as she cost but \$350,000 at the beginning of the Spanish war, it was decided to recommend that she be sold.

THE NEW BATTLESHIPS.

STRUGGLE IN THE CONSTRUCTION BOARD OVER THE QUESTION OF SUPER-IMPOSED TURRETS AND ALSO WITH REGARD TO SHEATHING—
OTHER WASHINGTON MATTERS.

WASHINGTON OFFICE OF THE MARINE REVIEW, 1345 PENNSYLVANIA AVE. }
WASHINGTON, D. C., January 24, 1900. }

Rear Admiral Hichborn, chief of the navy bureau of construction and repair, has been having clash after clash with the other members of the naval board of construction during the past week and so far he has come out victor. "I will be found dead in the last ditch before I will agree to superimposed turrets on the new battleships," said he. The naval board of construction stood four to one on this proposition three weeks ago. The one was Hichborn. It was regarded as practically settled then that the new battleships would be equipped with superimposed turrets, such as are on the Kearsarge and Kentucky. Rear Admiral Hichborn has since protested so thoroughly that the board has changed its views on the subject.

It must be admitted that there is much force to Hichborn's argument. The decision to abandon the plan which was so vigorously urged by certain officers is the personal triumph of Hichborn. Hichborn argued that the system varied so widely from that generally employed by all navies in the arrangement and installation of the heaviest guns as to cause surprise among naval experts that serious consideration should be given to the subject of installing them upon the new battleships before they had even been tested on the Kearsarge and Kentucky. He argues that at least the merits of the turrets upon the Kearsarge and Kentucky should be put to the test before the board equipped the most costly of its battleships with them.

Rear Admiral Sampson was a devoted advocate of the superimposed turret while at the head of the ordnance bureau and it was largely through his offices that they were introduced in the American navy. There is a saving of weight and a reduction of machinery in the superimposed turret—both of them of manifest advantage—but it does not follow that they outweigh the other disadvantages. There is always the danger in the superimposed turret that a single well-placed shot from the enemy's guns would cripple the whole battery, or so disarrange it that it could not be used. Then again there could not be freedom in firing. The fire would be alternate which in a period of excitement would be confusing. Hichborn talked to the naval board of construction straight from the shoulder. He pointed to the fact that none of the vessels in the late war were fitted with the superimposed turret and he even went so far as to say that the result of the Santiago engagement might have been different had they been so equipped.

"I am firmly convinced," said the chief constructor, "of the disastrous consequences of such a design in actual warfare. I can see the theoretical advantages of the concentration of the main battery and the possibility of a greater arc of fire, but I seriously doubt the practical utility of the design. This question of double turrets has been threshed out time and again in European boards of construction, but no other nation has ever adopted it in the construction of its battleships. Though beautiful in theory it is likely to be disastrous in practice. There is no structural objection to the double turret. That has been demonstrated. The objection is a military one. Suppose for instance, that the Oregon and the Kearsarge were in combat. Following the illustration along, suppose that four guns of the Oregon are out of action and also four of the Kearsarge. What then is the condition? The Oregon has only to make a complete turn to face the Kearsarge again with four powerful guns. In such a conflict what chance does the Kearsarge stand? In addition to that, suppose a single shot should strike the turret. Isn't it going to raise the very mischief with the mechanism? It might not hurt the guns, but wouldn't it cripple the turret?"

"The objection to the double turret is purely a fighting one. The mutual interference of the guns and the lack of independent control renders the double turret less effective from a fighting standpoint than separate ones. Then again there are the questions of heat and smoke and poisonous gases generated by the explosions. The man fighting his ship cannot stay in his turret. Both at Santiago and Manila he had to vacate it and fought the battle standing on top of the turret. In the double turret it is impossible for the officer to stand on the outside. I contend also that one man cannot manage four heavy guns during the excitement of conflict. The superimposed turret in my judgment is not practical."

THE NEW BATTLESHIPS.

Strange as it may appear, a majority of the naval board of construction are opposed to sheathing the new battleships. The board stands four to one on the subject. Rear Admiral Hichborn is the sole advocate of sheathing today. It is extremely unlikely that congress will permit the ships to be built unsheathed. The same members of the construction board who today are opposed to sheathing were strongly in favor of it last spring, and so potent were their arguments that congress directed that the ships should be sheathed and appropriated the additional money therefor.

"Why the decision of the board not to sheath the ship," said Rear Admiral Hichborn, "makes a different sort of a ship altogether from the one contemplated. I am in favor of sheathing. I think a sheathed ship is much more efficient than an unsheathed one and I don't think that congress will authorize the change."

The new battleships are indeed at present in a somewhat embryonic stage. With the armor question unsettled, with the revival of the proposition to sheathe or not to sheathe, and with the battery a dark secret the time of issuing the circular is indefinite. It was supposed that circulars regarding these new battleships would be issued in two or three weeks.

DRY DOCKS OF MASONRY.

The senate bill providing for change of material in dry docks at Mare and League island navy yards from timber to concrete and masonry passed on Saturday last and now needs only the signature of the president to become operative. The bill carries with it an appropriation of

\$700,000. The dry docks must be completed by April 1, 1902. Both are designed to accommodate the largest battleships afloat. The comparative merits of masonry and timber docks are shown by the fact that repairs for seven years from 1892 to 1899 on the masonry dry dock in Boston built in 1833, Norfolk built in 1834, and New York built in 1851, amounted to only \$4,543 while the cost of repairs on the timber dry docks of recent construction at League island built in 1891, at Norfolk built in 1889 and New York built in 1890, amounted to \$426,073.

REJECTION OF THE HOLLAND.

The naval board of construction has recommended the rejection of the submarine torpedo boat Holland by the navy department, even though the trial board made a most enthusiastic report upon the boat and urged not only its acceptance but the exclusive possession of the patents relating thereto. It is understood that the recommendation of the naval board of construction is due not so much to any demerit which the Holland may have, but rather to the failure of the Holland company to complete the submarine boat Plunger, which it is under contract to build for the government. The Plunger is 85 per cent. completed, but is impractical in its present shape. Its system of machinery will have to be entirely reconstructed and electricity substituted for steam.

SHIPPING BLOCKADES ON THE LAKES.

OFFICIAL REPORT TO THE SENATE SUBMITTED BY COL. G. J. LYDECKER THROUGH THE WAR DEPARTMENT.

Washington, D. C., Jan. 24—Following is a transcript of Col. G. J. Lydecker's report, relative to vessel blockades during the past season in the St. Mary's river and the St. Clair Flats canal, and the amount of damage resulting therefrom:

Brig. General James M. Wilson, Chief of Engineers:—In accordance with your instructions of Dec. 14, 1899, I have the honor to submit the following report in relation to blockades of navigation in the St. Mary's river and St. Clair Flats canal, to meet the requirements of a resolution adopted in the United States senate, Dec. 13, 1899, as follows:

"Resolved that the secretary of war be, and he is hereby directed, to report to the senate: First, the number of days during the season of 1899 on which navigation was blocked by reason of an accident occurring in St. Mary's river and in the St. Clair flats canal respectively; also the approximate money loss to the vessel interests by reason of such delays. Second, whether in his judgment additional canals should be constructed in the two waterways above mentioned, or in either of them."

Navigation has been twice blocked in the St. Mary's river during the past season and the total period during which general navigation was suspended because of these two blockades was 8½ days; the first was the so-called Houghton and Fritz blockade of the Sailors' Encampment channel Sept. 5 to 10, and the second was that of the Siemens, Holly and North Star, by which the upper entrance to Hay Lake channel was obstructed from Nov. 28 to Dec. 1. The circumstances attending these accidents may be briefly outlined as follows:

First—The steamer Douglass Houghton with barge John Fritz in tow, entered the Sailors' Encampment cut, bound down, and on making the turn in this narrow passage—300 feet wide—a section of her steering gear parted. She then struck the west bank, bow on, and was carried by the current broadside across the channel with stern against its east bank. Her consort, the Fritz, following on, struck her amidships and sunk her with a hole 2 by 8 feet in her side. The accident occurred about 1 o'clock p. m., Sept. 5, 1899, and it was not until 3 p. m. Sept. 10 that the Houghton was swung around so as to open a narrow passage through the deep water channel. In the meantime navigation was entirely blocked to all vessels drawing over 13½ feet of water. Those drawing less than 13½ feet were able with the assistance of tugs to pass through the old channel eastward of the wreck, but it was a difficult and dangerous undertaking, as there were numerous boulders in this channel, some of which had only 12½ feet of water over them. The hulls of several vessels were considerably injured in making the passage. There were 332 vessels delayed by this accident, 219 of which were down-bound and 113 up-bound.

Second—The steamer Sir William Siemens with barge Alexander Holly in tow left the canal pier at Sault Ste. Marie at 6 a. m., Nov. 28, 1899, followed by the steamer North Star without tow; the latter attempted to pass the tow ahead of her and thereby brought about a condition of affairs which resulted in both steamers grounding in the banks of the narrow cut—300 feet wide—which constitutes the upper entrance to the Hay Lake channel. The barge Holly ran into her towing steamer, the Siemens, in the mix up but did not break any of her plates below the water line. As a result of this accident navigation of this channel was completely blocked from 6:30 a. m. Nov. 28 to 5 p. m. Dec. 1, and 167 vessels were delayed by it.

The St. Clair Flats canal was blocked by the tow barge John Fritz for a period of about 1½ days Dec. 4 to 6, and the facts in this case, though not so well known as those relating to blockades in the St. Mary's river, were substantially as follows: The vessel was down-bound in tow of the steamer James Watt, and had passed through the canal and about 900 feet below the piers when her tow line parted and she went aground, eventually swinging across the channel and blocking it completely, with her bow on the west bank and stern on the east bank. The accident occurred on the afternoon of Dec. 4 and the blockade continued until about 10 a. m. Dec. 6, when the barge had been removed and the channel reopened to navigation. It has been found impossible to obtain any complete statistics of the delays incident to this blockade, but it is known that thirty-five vessels of the largest class were affected, twenty-eight of which were down-bound and seven up-bound. The total vessel delay attaching to this blockade aggregated about 300 hours, and the resultant money loss is believed to have been no more than \$10,000; but as before intimated, it has not been possible to obtain anything like full and specific data respecting this mishap.

The money-loss to vessel interests by reason of delays resulting from the two blockades in St. Mary's river has been conservatively estimated from precise data to aggregate \$370,118, viz., \$227,373 attaching to the

Houghton blockade at Sailors' Encampment and \$142,745 to the Siemens blockade at Little Rapids. But I think it should be recognized that the total money loss to vessel interests is not limited to the items of delay, because it does not include certain other incidental expenses, especially such as the cost of removing and repairing the wrecked or stranded vessels and damages sustained by other vessels in their endeavors to pass outside of the obstructed channel also. I therefore feel justified in reporting that the total loss to vessel interests resulting from these three blockades may be conservatively estimated at \$675,000, of which \$490,000 is attributed to the Houghton blockade, St. Mary's river, \$175,000 to the Siemens blockade, St. Mary's river, and \$10,000 to the Fritz blockade, St. Clair flats.

The above conclusion has been reached after a careful study of the tabulated statistics, reports and discussions which are submitted herewith.* It will be seen from these that much time and labor have been applied in collecting accurate data and that many perplexing questions are presented in the attempt to arrive at a fair statement of money losses. The discussions and reports were made independently by three of the officials who have been for a long time intimately connected with the navigable interests involved. The conclusion reached by them as respects money losses differ from those herein reported, but it is a natural result of independent analysis and conclusion respecting the complex issues presented for consideration.

Referring to the final clause of the resolution, I have to report it, as my opinion, that additional or wider channels are essential to safe navigation in the localities referred to, and that projects with estimates of cost for providing such channels will soon be presented in response to the requirements of the river and harbor act of March 3, 1899.

Detroit, Mich., January 1900.

(Signed) G. J. LYDECKER,
Lt. Col., Corps of Engineers, U. S. A.

* Several tabulated statements are submitted with Col. Lydecker's report to support conclusions.

DRIFTING FROM NEW YORK.

GRAIN EXPORTS THROUGH SOUTHERN PORTS AND BY WAY OF ST. LAWRENCE RIVER AGAIN AROUSES INTEREST IN ERIE CANAL QUESTION.

The principal cities of New York state, which would be especially benefited by an enlarged Erie canal, are so thoroughly aroused over the signs of immediate competition from the Canadian-St. Lawrence route, where 14 feet navigation from lakes to Atlantic seaboard will be provided next season, that radical action along the line of canal improvement is expected as a result of the report of Gov. Roosevelt's advisory committee, which is now so generally discussed. A Buffalo vessel owner who has given close attention to the New York state canal question, said at the recent annual meeting of the Lake Carriers' Association:

"No improvement short of a canal that will be of capacity sufficient to provide for canal boats carrying 1,000 tons, as suggested in the present agitation, is, of course, worthy of consideration. An Erie canal with tows of three boats each carrying 1,000 tons would put to rest for a long time to come any thought of the railroads taking the bulk of the grain through from Chicago to New York, as they did for a few months last season when lake freights were unusually high. It has been said that the expenditure required for such a waterway will be so great that there is little possibility of obtaining the money, unless the great interests of New York city arise to the gravity of the situation and undertake the canal improvement, irrespective of the districts that are not specially benefited by canal business, but I understand the governor's advisory committee has gone into this feature of the question and will urge a plan of solution that should prove satisfactory."

Another report from the treasury bureau of statistics, just sent out from Washington shows how the southern ports have been gaining in grain exports at the expense of the lake route and especially at the expense of the port of New York. The report deals with exports of corn, wheat and flour from the United States and from Atlantic and Gulf ports, particularly during the calendar year 1899, compared with preceding years. The figures, it should be premised, show a falling off in exportation of wheat in 1899 as compared with 1898 which was an abnormally heavy year; the corn exports of 1899 are about the same as those of 1898, but greatly in excess of any preceding years, while the flour exports of 1899 are slightly larger than those of any preceding year, being 18,900,000 barrels against 16,569,904 in 1898 and 17,408,713 barrels in 1892.

Exports of corn have grown steadily during the decade, starting with eighty-six million bushels in 1890, and ending with 207,000,000 bushels in 1899, the growth having been steadily upward and no preceding year equalling the figures of 1898 and 1899. In wheat there has been a much greater fluctuation, the years 1891 and 1892 showing an exportation of nearly 130 million bushels each, 1894 and 1895 dropping to about one-half that quantity, while 1898 made the highest record of our exports with 149,245,685 bushels, 1899 again dropping to about the normal or average amount with 111 million bushels. Flour has steadily increased, the exports of 1890 being 11,319,456 barrels and those of 1899, 18,900,000, an increase of over 50 per cent.

The following table shows the exportation from the United States of corn, wheat and flour in each calendar year from 1890, to and including 1899, the figures of 1899 being subject to slight revision:

	Corn, Bushels.	Wheat, Bushels.	Flour, Barrels.
1890	86,817,220	49,271,580	11,319,456
1891	30,693,505	129,638,934	13,023,692
1892	77,471,179	125,518,441	17,408,713
1893	55,143,918	108,377,569	16,440,603
1894	41,806,711	72,523,389	16,056,390
1895	61,956,638	66,804,686	14,528,761
1896	131,960,530	83,755,829	15,855,836
1897	189,127,570	109,909,328	13,596,359
1898	207,309,381	149,245,685	16,569,904
1899	207,800,000	111,000,000	18,900,000

GAINING UPON NEW YORK.

An analysis of exports by ports shows that in the exports of corn several of the great ports on the Atlantic and Gulf are gaining upon New York, and that the movement from the grain fields toward the seaboard is apparently being more generally distributed than formerly. The exports of corn, for instance, from the port of New York increased from thirteen and one-half millions to forty million bushels between 1893 and 1899, an increase of 200 per cent., while those from Boston increased from five and one-half millions to seventeen and one-half millions; those from Philadelphia, from four millions to twenty-nine millions; Baltimore, from seven and one-half millions to forty-six millions; New Orleans, from six and one-half millions to twenty-two millions, while Newport News and Galveston, for which the record begins with 1895, show for Newport News an increase from four and one-half millions in 1895 to fourteen millions in 1899, and Galveston from one and one-quarter millions in 1895 to seven millions in 1899. Thus Philadelphia, Baltimore, Newport News, New Orleans and Galveston show a much larger percentage of growth in their exports of corn than does New York or Boston.

In wheat exportations Boston has made greater gains than any other Atlantic port, the total having grown from 3,934,125 bushels in 1893 to 11,567,847 in 1899, while at New York, Philadelphia, Baltimore, and New Orleans the figures for 1899 are in each case actually less than in 1893, the figures for New York being 36,437,499 bushels in 1893 and 26,830,386 in 1899; Philadelphia, 5,657,398 bushels in 1893 and 4,013,927 in 1899; Baltimore, 13,048,702 bushels in 1893 and 9,549,270 in 1899, and New Orleans, 12,896,734 bushels in 1893 and 11,562,812 in 1899; Galveston, however, shows a marked gain, the figures for 1896 being 3,438,369 bushels and those of 1899, 15,713,400. Prior to 1896 the wheat exportations from Galveston were small, seldom reaching 1,000,000 bushels, but in 1896 they amounted to 3,438,369 bushels and have steadily grown until, as already indicated, they were in 1899 15,713,400 bushels, in spite of the fact that the total exports of wheat from the United States in 1899 were materially below those of the preceding year.

In flour also the drift appears to be away from New York, whose exports of flour in 1893 were 6,448,931 barrels, and in 1899 4,741,035, while Philadelphia, Baltimore, Newport News, Norfolk, New Orleans and Galveston show more or less increases in 1899 as compared with 1893.

PORTAGE LAKE SHIP-CANALS.

COMMERCE OF THE FAMOUS COPPER REGION IN THE UPPER MICHIGAN PENINSULA, SEASONS OF 1897, 1898, 1899.

Statistics of commerce in Portage Lake ship-canals, printed herewith, are from the annual reports of Major Clinton B. Sears, United States engineer in charge. Development of these waterways is due largely to the great copper industry of the Portage district. There is also included in reports of the commerce of these canals the freight carried by regular line boats that stop at towns in the copper region to take on or discharge only a part of such freight. In 1899 there was moved through these waterways 1,582,169 net tons of freight, valued at \$54,994,843.70. In 1898 the tons of freight aggregated 1,367,685, and in 1897 the total was 1,020,723 tons.

COMMERCE OF PORTAGE LAKE SHIP-CANALS—SEASONS OF 1897, 1898 AND 1899.

ITEMS.	Designation.	SEASONS.		
		1897	1898	1899
Steam vessels.....	Number.....	2,517	3,282	3,230
Sail vessels.....	"	414	627	701
Tonnage, registered.....	Net tons.....	1,025,375	1,447,216	1,367,883
Passengers.....	Number.....	34,942	30,405	34,714
Coal.....	Net tons.....	438,604	619,009	639,558
Flour.....	Barrels	450,712	467,215	343,633
Wheat.....	Bushels	60,000	143,000	247,328
Grain (not wheat).....	"	4,000	56,225	175,299
Salt.....	Barrels	136,270	68,703	44,280
Copper.....	Net tons.....	78,732	83,992	72,320
Iron ore.....	"	4,949	15,529	59,014
Pig iron.....	"	3,330	8,597	9,460
Manufactured iron.....	"	10,436	24,092	27,821
Lumber	M. ft. B. M.....	99,113	155,395	213,566
Logs.....	"	26,250	18,051	39,785
Building stone.....	Net tons.....	17,482	63,663	39,593
Miscellaneous merchandise.....	"	174,629	190,650	206,278
Total freight.....	"	1,020,723	1,367,685	1,582,169

ESTIMATED VALUE OF FREIGHT PASSING THROUGH PORTAGE LAKE SHIP-CANALS DURING THE SEASON OF 1899.

ITEMS.	Designation.	Quantities.	Price per Unit.	Valuation.
Coal (Anthracite).....	Net tons.....	46,805	\$5.25	\$245,726.25
Coal (Bituminous).....	"	592,753	.30	1,956,084.90
Flour.....	Barrels	343,633	.75	1,288,623.75
Wheat.....	Bushels	247,328	.75	185,496.00
Grain (other than wheat).....	"	175,299	.70	122,709.30
Manufactured iron.....	Net tons.....	27,821	60.00	1,669,260.00
Pig iron.....	"	9,460	20.00	189,200.00
Iron ore.....	"	59,014	2.00	118,028.00
Salt.....	Barrels	44,280	.85	37,638.00
Copper	Net tons.....	72,320	340.00	24,588,800.00
Lumber	M. ft. B. M.....	213,566	15.50	3,310,273.00
Logs.....	"	39,785	10.00	397,850.00
Building stone	Net tons.....	39,593	6.50	257,354.50
Unclassified freight	"	206,278	100.00	20,627,800.00
Total				54,994,843.70

MR. GRISCOM ON THE SHIPPING BILL.

Washington, D. C., Jan. 24.—It is probably unnecessary to explain to readers of the Review that Mr. Clement A. Griscom, president of the International Navigation Co., did not, in his testimony before the commerce committee of the senate on the shipping bill, disclose any scheme on the part of his company to place their fast ships under foreign registry or that, as has been intimated, he made any threat of what the company would do or would not do.

"I have pointed out to the committee," said Mr. Griscom in referring to his testimony, "the results that would necessarily follow the failure of congress to enact remedial legislation for the benefit of American shipping interests, and in the course of my statement, I said that the mail contracts which we have do not begin to compensate us for the extra expense involved in being under the American flag. I did suggest, by way of illustration, that at the expiration of our present mail contracts, unless congress in the meantime enacts remedial legislation on the lines of the bill now before the committees, we would have to put our fast ships under the British flag; and I expressed the opinion that all hopes of continuing the construction of fast liners, such as those which proved so useful during the Spanish war, must necessarily cease, unless congress took the steps we believe right and just to the shipping interests."

Along the line of the above interview with Mr. Griscom it will be of interest to quote from his testimony before the committee. He said:

"It is proper at this point in my statement that I should inform you that these four fast steamships (St. Louis, St. Paul, Paris and New York), after being charged with a sufficient sum properly to offset the opposition which follows a high-speed ship constantly employed, have never made us a dollar. And it has only been possible for us to continue with these ships under the American flag because our eleven ships under foreign flags, from the beginning of our business in 1873 down to date, have given us a fairly good return. If we had invested the money, about \$10,000,000, these four fast ships cost, in ships of the type in which we conduct our other services, steamships of moderate speed and large capacity, and operated them under a foreign flag, we should have been far more prosperous and so far as pecuniary results is concerned, laying aside all patriotic impulses, the result would have been commercially entirely satisfactory. This service of fast ships cannot be continued under the American flag after the expiration of our present mail contract upon the terms under which they are now running. And all hope of continuing the construction of such ships, which proved so useful to the government in the Spanish war, will inevitably cease. If we could have remained British without any postal contract, we would have been \$136,000 per annum better off. That does not include the excess cost of maintaining a 20-knot spare boat to insure the regular mail service, rather than a moderate speed one, as is permitted to our foreign competitors. This important item added to our disability \$279,000 per annum, making an aggregate disability of \$415,000 per annum, which is the tax we have paid for raising and maintaining the American flag on these four boats. Under the bill which is now submitted to your consideration, this mail service will receive \$422,000 more than it now receives for carrying the mails, which you will observe, barely removes our present disability, and I hope this statement will correct the impression prevailing with some, that the high-speed boats are overpaid in the proposed new bill.

"Should any one doubt the inadequacy of the mail pay under our postal law he has only to reflect that there never has been any effort made by anyone else to obtain a transatlantic contract. If the postal bill had fulfilled the purpose for which it was intended there should have been, and if the pay had been adequate there would have been, lines to every important European seaport. It is not for a moment to be considered that the development of our mercantile marine means only such ships as we have been discussing. A certain number of those are necessary to naval and military exigencies for the swift and safe carriage of mails and passengers, and perishable freight which demands high speed, but even under the conditions of the bill under discussion the compensation for high-speed ships will not procure their increase, excepting by companies or organizations of men who have slower and larger carrying equipment to support them. It is a correct parallel to cite the great trunk line railroads which run limited trains at high speed, luxuriously fitted, to protect and care for certain public demand. But everyone knows that the earnings of every one of these great systems is derived from the enormous volume of freight and passengers carried in large quantities and at moderate speed. It is precisely so with the steamship service. It is the 'beast of burden,' which is to meet the great bulk of everything we have to support, and it is happily most encouraged by the terms of this bill.

"The peril of having our export trade dependent upon the British and German nations being at peace with the world, for they are the great carrying nations on the sea, has already been referred to in this hearing. It requires no imagination to picture the distress that would prevail in this country if its export trade of farm products and manufactured goods should suddenly stop because either of the carriers who are our customers had become a belligerent nation. We carry only 8 per cent. of our exports under our own flag, while 85 per cent. is liable at any moment to be absolutely cut off if Great Britain and Germany become involved in war, and about 65 per cent. would be cut off if Great Britain alone became involved with a maritime nation. Already our traffic is embarrassed because of the ships Great Britain has withdrawn simply as transports in the war with the Transvaal. Suppose her flag on the high seas was threatened?

"It is amazing that there is a legislator who is so indifferent to the interests of his constituents as to permit this situation longer to menace our export trade. When our export trade was insignificant this may not have been a pressing question; certainly congress did not think it was. But can congress now hesitate when our exports of farm products and manufactures amounted in 1898 to \$1,231,000,000? Is there a reflecting farmer or manufacturer who will longer tolerate this risk? No scheme will remove this peril which constantly threatens our foreign trade that does not establish and maintain a national merchant marine."

Mr. F. T. F. Lovejoy, secretary of the Carnegie Steel Co., Ltd., resigned a few days ago and was succeeded by A. W. Moreland, who had been auditor of the company.

NEW NOTES FROM THE SHIP BUILDERS.

The Electric Launch Co. of New York City, a branch of the Electric Boat Co., which recently absorbed the Holland Submarine Torpedo Boat Co., has made arrangements to erect a large plant at Bayonne, N. J. The land which the company has purchased consists of upward of three acres above tide water and five acres under water. Six buildings, most of which will be of brick and stone, will be erected. Work upon a temporary building, 50 by 150 feet, will begin at once and ultimately over \$100,000 will be expended in the improvement of the property. The new ship yard will give employment to about two hundred men.

Mr. R. H. Langford, whose ship yard is at the foot of Baylen street, Pensacola, Fla., is engaged in the construction of a number of lighters for the use of the Munson Steamship Co. for service in gulf, Cuban and South American ports. The vessels are of two sizes, 80 and 106 feet in length respectively, copper sheathed to the load line and fitted with masts, hoisting engines and apparatus. Ten of these vessels are nearing completion, three are on the stocks and work upon two others is about to begin.

Denial is now made of the report recently circulated to the effect that the Delaware, Lackawanna & Western Railroad Co. intends to build and maintain a fleet of lighters and tug boats in New York harbor. Instead the railroad has renewed for five years longer the contract which it has had for twenty years past with the Starin Transportation Co. of New York City to do all its towing and lighterage work. The Starin company has recently made extensive improvements in its equipment.

The ship yard project of Townsend & Downey of Brooklyn, N. Y., who submitted a bid for one of the cruisers of the Denver class, has been incorporated. The name selected is Townsend & Downey Ship Building & Repair Co. of Brooklyn, N. Y., and the capital stock is \$1,500,000. The incorporators are James A. Townsend, Wallace Downey, Samuel Q. Brown, A. S. Sumner and Charles B. Bowers.

The new ship yard and dry dock project at New Orleans now appears on the point of consummation. Mr. Robert C. Morris of 1008 Hennen Building, New Orleans, is the prime mover in the project. Several options on sites have been secured and it is expected that should no unforeseen delays intervene the formal organization of the new company will take place within the next ten days.

A new police boat, to be christened the A. S. Ashbridge, will be constructed for the city of Philadelphia, to replace the old vessel, William S. Stokley. An appropriation of \$85,000 has been made for the new boat, the plans for which have been drawn by A. Cary Smith, the New York naval architect.

Officials of the Bath Iron Works, Bath, Me., state that they are offered more contracts than the capacity of their plant would justify them in accepting and are undertaking only a very limited quantity of new work owing to the difficulty of securing material from the steel manufacturers.

Influential citizens of New London, Conn., are endeavoring to organize the New London Ship Building Co., with a view to the establishment of a ship yard and marine railway at New London. A site has already been selected at an advantageous point on the river.

The Atlantic Coast Steamship Co. has been incorporated at Jersey City, N. J., with a capital stock of \$500,000 to operate a line of steam vessels. The incorporators include J. L. Crosthwaite of Buffalo, L. A. Hall, W. B. Flint and E. D. Jackson.

Rumor regarding the consolidation of prominent ship yards has again lapsed. A stockholder in the Wm. Cramp & Sons Co. is, however, authority for the statement that a nominal option has been given on the Cramp plant.

Davis & Sons, Kingston, Ont., have just begun the construction of a steamer to be placed in service on the Lake of the Woods, Canada. The vessel will be 70 feet in length and will be completed in time for service next summer.

H. M. Bean, the Camden (Me.) ship builder, will, on March 1, inaugurate the nine-hour system in his yard. Mr. Bean has a large number of vessels under contract and will add considerably to the equipment of his plant.

William Rogers of Bath, Me., has contracted to build a four-masted wooden schooner for William F. Palmer of Dorchester, Mass. The oak timber for the vessel is now being cut.

The South Bay Co. of Passaic, N. J., has been incorporated to construct steamers by F. T. Grace of Passaic, A. D. Hitch of South Orange and J. C. D. Hitch of Nutley, N. J.

SHELTER FOR TORPEDO BOATS.

Attention has repeatedly been called to the inadequate facilities for the care of the torpedo boats of the United States navy; indeed there is in fact almost entire absence of facilities in this regard. The Army and Navy Register, commenting on the extension of time granted for the completion of the torpedo boats now building, says:

"It is easy for the navy department to view with equanimity the delay in the completion of the boats. The government possesses no facilities for properly taking care of the ships. They cannot be left in the open weather to the ravages of the elements, and this would be their fate were they completed upon the dates named in the contracts. It is difficult to understand why the government finds itself in the awkward position of not possessing the simple means of housing torpedo boats. It was known that there were shortly to be in the possession of the government a large number of these small vessels, requiring almost constant care, and, when not in actual use, some special means of protection under a system which would admit of their speedy utilization in time of emergency. This is the more remarkable because the navy department has had at its command \$150,000 for the construction of a torpedo boat shelter to be built at the Boston navy yard. This should be expended in the direction authorized, without delay, in anticipation of the completion of the torpedo boats. The naval appropriation bill should contain additional allotments for the construction of similar shelter at other points so that the torpedo boats out of service may be kept at convenient places along the coast."

THIRTY-FIVE YEARS IN VESSEL BUSINESS.

After thirty-five years of connection with shipping on the great lakes, Mr. B. L. Pennington of Cleveland a few days ago sold out his last interest in ships. He was in a reminiscent mood when the subject was referred to.

"Yes, I have sold out my vessel business," he said. "I bought my first 'timber head' in 1865 and have since, at various times, owned interests in eighteen lake craft. I have carried ore for \$6 a ton freight from Marquette to Cleveland and I have carried it for 50 cents from Duluth to Buffalo. I have owned in vessels that carried grain at over 20 cents a bushel from Chicago to Buffalo, and I have carried it between those ports for a cent a bushel. Years ago I managed a steamer and consort that had a three-year's ore contract, Marquette to Cleveland, at \$3 a ton, followed by a contract for three years more at \$3.25 per ton; when they delivered it below Cleveland they got 25 cents a ton extra. They were small boats, but they lost no money on those contracts. A 7,000-ton freighter of today would have a bonanza in such a six years charter, but on the basis of ore charters already made for 1900 (\$1.25), vessel owners will have no cause to complain."

Asked as to why he quit the vessel business in view of the present flattering prospects, Mr. Pennington said: "Another business with which I am connected demanded my constant attention. Having decided to sell the best time to do so was when favorable prospects appeared for the purchaser."

"The individual vessel owner, except perhaps those with large fleets, is fast passing away," Mr. Pennington continued. "The great combinations with their own mines, their railroads, their boats, their furnaces, their mills, and, through monopoly, their almost absolute control of the markets, are well nigh impregnable Gibralters for the tramp lake tonnage to buck against in competition. But the tramp boat will still be needed for grain, coal and other wild freight. There is still a very promising future for the smaller sized craft. They are a necessity to the shippers for several reasons: First, when purchasers order and can take care of only small cargoes; again when docks for loading or discharging are of short space, where only a small boat can be used, or at docks where only two or three hoists can be accommodated or furnished; and still again at docks either at port of loading or discharge where the draught of water is insufficient for a large boat. Under any of these conditions the shippers must inevitably employ the small boats, and since their earning-profit is less, proportioned to investment, than on the large boats, it follows that they should henceforth have extra compensation for the favor so long extended to the shippers, and often as an accommodation. All the smaller craft of the lakes—principally the wooden craft—could quite easily, I believe, form an organization of their own and stand together in the effort to secure a reasonable rate over that accorded to the larger tonnage. There is no question but that such demand would be complied with. It is true that the increase of freight would induce shippers to improve the conditions, so that large craft at cheaper freight could be used, but such process of change must be slow. Its consummation would probably not antedate the life of most of the smaller wooden boats now afloat. As no more of these latter are being built, the problem would thus solve itself to the satisfaction of all concerned."

JOHN P. HOLLAND—A PATIENT INVENTOR.

The announcement from Washington that the naval board has disagreed as to the advisability of purchasing submarine torpedo boats of the Holland type directs attention to the long series of disappointments which have come to Inventor John P. Holland and the remarkable fortitude with which he has borne them. Mr. Holland was a schoolmaster in Cork, Ireland, when the battle between the Monitor and Merrimac occurred in Hampton Roads and he was impressed at once with the conviction that the day of wooden walls for war vessels had passed. The suggestion of the possibilities of the submarine boat came soon after. There was a recurrence of the suggestion in 1870 when Mr. Holland was compelled to take a vacation from his duties as a pedagogue, owing to ill health. A preliminary design for a submarine craft was completed that year but the inventor put the plans away and thought little more of them until he came to the United States in 1873. In 1875 Mr. Holland was induced to send his plans to the navy department. In 1877 a friend advanced money for the construction of an experimental vessel, but he insisted that it be fitted with engines. The vessel was built at the old Albany street iron works, New York, and was experimented with on the Passaic river above the falls bridge at Paterson, N. J. Some important discoveries were made, although the inventor was hampered by an engine that proved to be practically worthless. This vessel was sunk in the middle of the Passaic river and abandoned, and work was immediately begun upon a second and larger vessel, which was finally completed in April, 1881. A 16-foot working model of the present vessel was built in 1882 and in this a number of new devices were embodied.

It was at this juncture that Mr. Holland sustained a disappointment quite as severe as any which preceded it. His partner, who had furnished the money for the construction of the two boats, took it into his head to have them towed to New Haven, without advising the inventor of the fact, and on the way the smaller vessel sank in 110 feet of water, opposite White Stone, Long Island. The other boat is still lying at New Haven. The partnership was dissolved by this episode. In 1886 Capt. Zalinski of dynamite gun fame organized a company for the exploitation of Mr. Holland's invention and a rough experimental vessel—wooden sheathing upon an iron frame—was built. This vessel fell off the ways while being launched and was irreparably injured. Then followed a long struggle for congressional appropriations, and on two occasions after the funds had been all but secured the money was diverted to other purposes. Another new company was formed, and finally, in 1895, Mr. Holland contracted with the government to build the Plunger. The requirements of the navy department were not at all to the inventor's liking, and realizing that the Plunger would be but an imperfect vessel he advised his company to build a boat in which he could embody his ideas untrammelled. This was done and the boat turned out is the Holland, which has recently been subjected to tests in Peconic bay.

NAVAL STRENGTH OF THE POWERS.

A parliamentary paper just published in England is intended to show the fleets of Great Britain, France, Russia, Germany, Italy, the United States and Japan, distinguishing the various types of vessels built and building. The return shows the date of launch, the displacement and the armaments reduced to one common scale. The last time the return was issued was in May, 1898. Vessels which appeared on Oct. 15, 1899, in the official list of each navy as built or building are enumerated, including under the latter head those for which on that date money had been appropriated and which were shortly to be laid down. The following tables exhibit the total number of vessels in each class belonging to each nation:

VESSELS BUILT.

	Great Britain.	France.	Russia.	Germany.	Italy.	United States.	Japan.
Battleships	53	31	12	18	15	5	3
Cruisers, armored	17	8	10	3	3	2	3
Cruisers, protected	107	36	3	13	15	14	14
Cruisers, unprotected	15	14	3	21	1	6	9
Coast defence, armored	13	14	15	11	—	19	4
Special vessels	3	1	5	3	2	1	—
Torpedo vessels	35	15	17	2	15	—	1
Torpedo boat destroyers	75	2	1	1	—	1	8
Torpedo boats	95	219	174	113	144	16	29

VESSELS BUILDING.

Battleships	17	4	12	7	4	11	4
Cruisers, armored	14	12	2	2	4	3	4
Cruisers, protected	9	4	8	4	3	7	2
Cruisers, unprotected	—	—	—	—	—	—	—
Coast defence, armored	—	—	1	—	—	4	—
Special vessels	—	—	2	—	—	—	—
Torpedo vessels	—	—	—	—	—	—	—
Torpedo boat destroyers	33	10	35	9	11	19	4
Torpedo boats	—	47	6	—	10	14	29

France has three submarine boats built and nine building. Two or three vessels of this class are building in the United States, but none have as yet been taken over by the government.

THE SHIP BUILDING INDUSTRY.

The Age of Steel, one of the trade journals that contains each week a few well-written editorials on subjects close to the iron industry, publishes the following in a recent edition:

"The ship building industry of the United States is getting down to a solid working basis. There has been a deal of sentiment of a nebulous nature floating hither and thither on political platforms and in patriotic press talk, all of which has been useful in its way, but until put into working shape, was simply a windmill without the grist. Home capital, until of late years, was exclusively busy in railroad building, and in such a rush of internal improvement as naturally followed the rapid settlement of the north and west. The results are manifest in the gridironing of half a continent with Bessemer steel, the opening of numerous mines, the chain of towns from sea to sea, the mills and factories that are to be found everywhere, and the prosperous wealth-producing communities that live, move and have their being, in what, but a few decades ago, were vast and barren solitudes. In the evolution of an industrial and commercial empire, all this has been preparatory work, and a period of equipment for a larger domain of trade than can be held in the belt of oceans. First the locomotive, then the ship. Capital has now an ocean to swim. It floats its cargoes and distributes its products and merchandise wherever the keel of a ship can reach a quay without scratching mud. Its export business is enormous, and it is in line with American energy and ambition to make the best of opportunities. If there are any plums or profits in the ocean-freightage business, the country claims its share, and there will be no languishing of ship building enterprise till the goal is reached. Nor will the terminal point be in sight so long as American enterprise and workmanship are able to secure trade in providing ships for other expecting nations. Taking the Cramp works as an example in magnitude and capacity, in first-class mechanical equipment, and in all the accessories of management and capital, we have an idea or forecast of what the United States can and will do in ship building enterprise. The work under contract by this Philadelphia firm is valued at not less than \$19,000,000. Its capacity will soon double that of last year, while in labor-saving appliances it is already abreast of the best ship yards of Europe. There can be no question as to the ground-swell of a ship building revival in the United States, or of its potential character in framing a great future, not only for the iron and steel and related industries, but for skilled and unskilled labor, and for profitable investment of American capital. Prestige has been secured by the superb American-built ships of the American navy and by such ocean greyhounds as in form, strength and speed are second to none. There would seem to be little need of any but home process in this matter, as the material and the skill are here, and the purse strings of capital only need untiring for the best use to be made of what is now the marine opportunity of the United States."

A Washington wrecking company has a scheme to refloat the battleship Maine through the agency of liquid air, and in a circular just issued announces that a proposition to carry it out will be submitted to congress at the present session. So far as can be determined from the prospectus, it appears to be the plan of the wrecking company to build a cofferdam or some kind of protection around the sunken battleship and then with liquid air put a sheathing of ice around the hull preparatory to pumping it out and raising it.

TERROR OF MODERN WARFARE.

SOMETHING ABOUT THE GATHMANN TYPE OF HIGH EXPLOSIVE BEARING GUNS
—RESULTS OF NUMEROUS TESTS.

The battleships Iowa and Massachusetts could draw up within two miles of each other and fight a duel lasting all day, in which every projectile on both vessels, amounting to hundreds and hundreds of tons, would be fired at each other, and when it was all over and the smoke of battle drifted away both ships would be seen calmly riding the waves. The government is making a gun at the South Bethlehem works that is expected to change all this. Let it send just one shot home and all will be over, for its shell will carry 500 pounds of gun cotton, whose detonating force will crash in the sides of any armored vessel afloat. The government report on the destruction of the Maine says that about 200 pounds of gun cotton was used in the mine which wrecked that ship. But a faint idea may be gained therefore of the effect of over twice that amount exploding against a vessel.

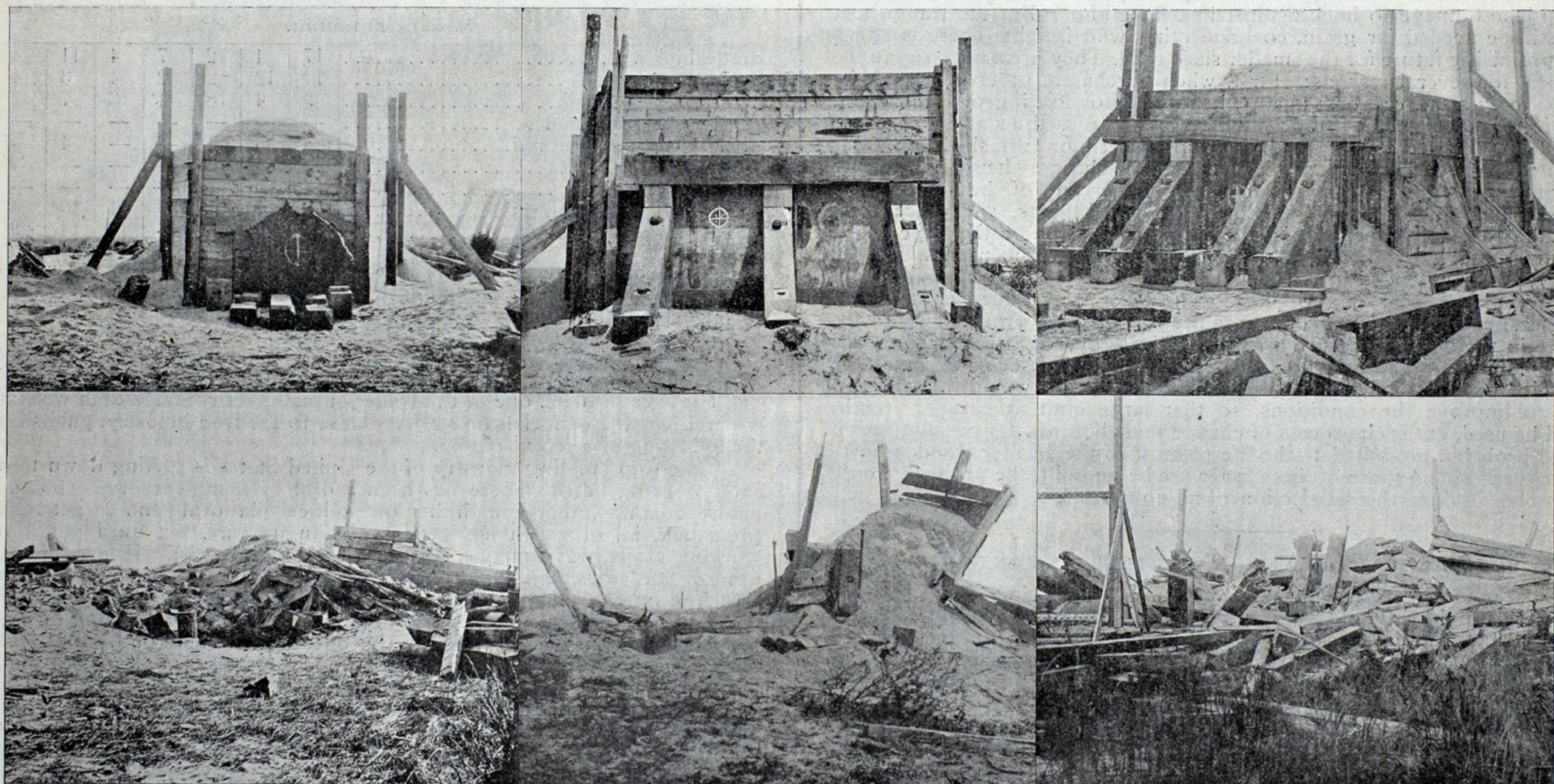
This gun and its shell are not altogether new. A year ago the results of the experiments performed with the Gathmann shell were a revelation, and congress readily appropriated the funds to build the Gathmann gun now in course of construction. At its completion congress will be invited to go down in a body to the proving grounds at Sandy Hook and see the gun scatter to the four winds of heaven an embankment of thousands of tons of earth and sand protected by Krupp plates 17 inches thick. This sight is likely to give the lawmakers the ability "to see the finish" of the modern battleship. The shell which has done such effective work is the

nickel steel was braced by nine 14 by 12-inch oak uprights and struts bolted to as many sleepers of the same size, and this was backed by 135 tons of earth. A shell weighing 945 pounds and containing 210 pounds of gun cotton was fired at the target from a 12-inch gun. Government photographs of the structure and the result of the shot are here represented. The plates were broken to pieces and driven in, the oak timbers snapped like jack-straws and the sand scattered to the four winds.

The impact of one of the large Gathmann shells carrying 500 pounds of gun cotton will be as great as that of a battleship of 12,000 tons while steaming under full headway. A distinguished American naval captain said that the effect of this shell would be to end all wars, for nations could not get sailors to man ships when they knew that to be struck by one shot from the enemy would send them all to the bottom, or if the shell only struck in their vicinity it would put the whole ship out of commission and cause it to drift as helplessly as a log by disarranging its machinery. A peculiarity of the explosive force is that it is all one way, and that way in the direction in which the projectile is traveling. This is shown in the illustration, where the light electrical screen standing in front of the target was not blown down, and light pieces of timber which were lying loosely about were not disturbed, while massive objects that stood in the way of the force were hurled hundreds of feet.

THE GUN THE SOUL OF THE SHIP.

Although it has been scientifically established that the best and heaviest armor will give no protection at all against the aerial torpedo, still a mistake would be made in using cheap armor. Where armor is used, the best is not too good regardless of price. But it should be remembered that the ship is only the carriage, while the gun is the soul of



FOURTEEN-INCH TURRET ARMOR AND EARTH BACKING.

TEN-INCH PLATE AND NINETY TONS OF EARTH.

TEN-INCH PLATE (CARNEGIE MANUFACTURE)
BACKED BY 150 TONS OF EARTH.

EFFECT OF GATHMANN GUNCOTTON SHELL.

RESULT OF ONE GATHMANN ROUND.

EFFECT ON PLATE, EARTHENWORKS AND TIMBERS
OF ONE GATHMANN 12-INCH SHELL.

invention of Louis Gathmann. Mr. Gathmann's aim was to obtain a shell which should be safe to handle, which no accident could explode, which might be struck and knocked to pieces by an enemy's solid shot or shell, and which could be fired at high velocity from a gun without exploding, yet which on impact against the sides of a vessel, an embankment or even on striking the water should explode. And this Mr. Gathmann has done.

SHELL'S AUTOMATIC ARRANGEMENT.

Supreme tests were made at the proving grounds to determine the safety of the Gathmann detonator. Armor-piercing shots were fired with a velocity of 2,400 feet per second, so as to strike the center of the detonator and pass through the shell charge. The fuse detonated by the impact, but the main charge of gun cotton was uninjured, although the shell was badly shattered, as is shown in the illustrations. The shell is built in two sections, the forward and larger part being filled with the explosive charge, the rear and much smaller section containing the fuse. They are separated by a partition that protects the powerful charge, even in case the fuse is exploded. This shutter is arranged so that it opens automatically from the centrifugal force given by the rotary motion of the shell after it leaves the gun. The impact on striking ignites a charge of fulminating mercury which detonates the dry gun cotton, and this in turn the greater mass of wet gun cotton.

The terribly destructive power in a charge of this substance is almost beyond belief. At the government tests of the Gathmann shell begun 3 years ago, and extending to February, 1899, shells containing charges of gun cotton weighing from forty-nine to 124 pounds were fired at steel plates flanked by earth works containing 100 tons of sand and gravel. These were in turn demolished as often as they were put up and sand scattered over acres of ground. Finally, at the special request of the secretary of war, a structure was built of extreme strength. A plate of

the ship of war. In building new men-of-war we have many able officers in the construction bureau to find a proper type of ship for aerial torpedo guns. Conditions will be radically different in such ships. They will have what is practically a ram reaching from five to six miles. It follows too that ships of war would be comparatively powerless against coast defenses constructed along these lines. A battery of these high explosive bearing guns, mounted on disappearing carriages, would have an enormous advantage over anything that could be brought to bear against them from the sea, as land guns can be pointed with a precision unattained on board ship. It is claimed therefore that by adopting aerial torpedo guns our government would save untold millions of money, and still have an adequate coast defence not attainable at all by the present ordnance.

Well-posted ordnance officers and engineers of ordnance and armor know that at two miles or further range the best and heaviest armor cannot be penetrated by gun-fire of the present type; therefore a battleship carrying aerial torpedoes would destroy its opponent before the latter could do serious damage. This is why it is claimed that the struggle for supremacy between armor and guns ceases with the adoption of aerial torpedoes. Photographs presented herewith are the best evidence of this claim, but it is noted further that Gathmann demolished a 6-inch nickel steel plate, which had previously withstood five rounds from a modern navy gun, and also broke the same with a wooden projectile carrying 100 pounds gun cotton by leaning against the plate; and further, a 17-inch nickel steel plate was completely demolished by Gathmann's method in the same way.

The photographs were obtained from the bureau of ordnance, war and navy departments, and by their kind permission are reproduced herewith. In the tests shown by illustrations a 12-inch gun was used in firing these torpedoes.

At a meeting of the committee on naval affairs of the United States

senate last February, R. B. Dashiell, assistant naval constructor, was questioned by the committee as to his opinion of the efficiency and safety of the Gathmann arm. In reply to a question from Senator Perkins Mr. Dashiell said that as an officer of an experimental station he had worked and studied on the subject of firing wet gun cotton. "There is absolutely no difficulty at all in firing wet gun cotton," he said. "It is just as inert as firing wet sand. But the difficulty has been in firing a primer of dry gun cotton, which is absolutely necessary to the explosion of the wet gun cotton. In all the experiments that I have seen since 1883 nearly every time that a fuse or primer of dry gun cotton has been fired there has been an accident. I have never heard of any accident with the latest device of Mr. Gathmann, and I think it ingenious, efficient and thoroughly safe."

MARIA THERESA AN INSTANCE.

In answer to a question of Senator Perkins as to the advantage of gun cotton over the ordinary shell now used he said: "As an example of what a 12-inch shell will do we have the Spanish cruiser Maria Theresa. She was struck by two 12-inch shells. They exploded in her. Therefore they had their maximum effect. That ship was not so injured but that she could be raised and started for home. Had a 12-inch Gathmann shell exploded I think it would have carried off her entire stern and everything aft of the point of impact. There would have been nothing left on that ship to float."

Senator Hanna then put the direct question to Mr. Dashiell: "Do you consider that the Gathmann shell has revolutionized the high explosive business for the use of army and navy guns?" to which he replied, "I do."

"That is, that it has upset all previous theories and that the results

AROUND THE GREAT LAKES.

John J. Boland, vessel and insurance agent of Buffalo, has moved his offices to 25 and 26 Exchange building, 202 Main street. The vessel interests of Buffalo are now quite well represented in the Exchange building.

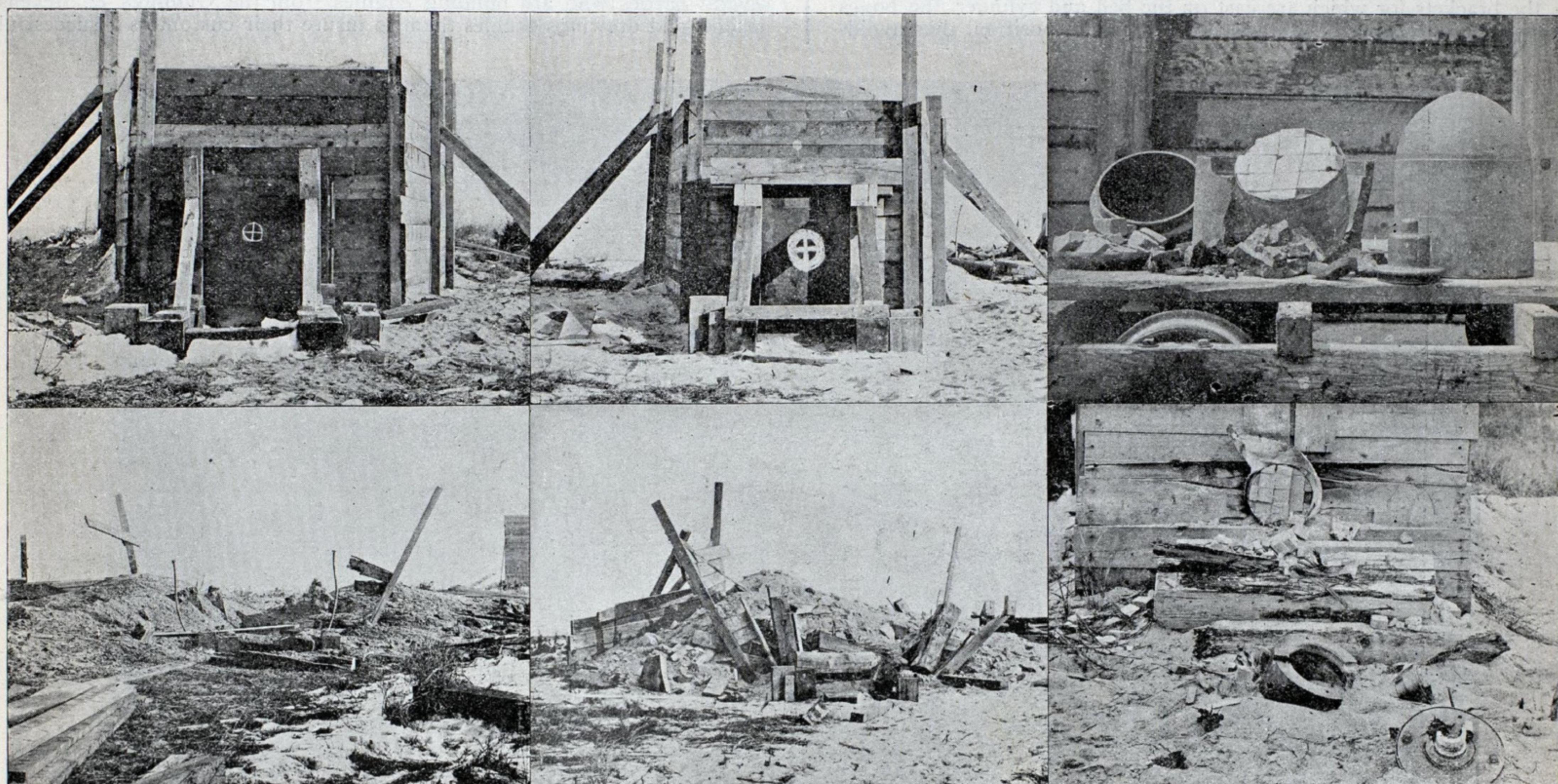
Capt. Geo. P. McKay of Cleveland, has gone to California, not to return until about the middle of April. Capt. John Mitchell of Cleveland, and Capt. James Dunham of Chicago, are on the Atlantic, bound for the Mediterranean. They will return about the opening of navigation next spring.

Mr. J. A. Cuttle is the new manager of the Montreal Transportation Co. He entered the employ of the company in 1876. In 1890 he assumed charge of the company's offices, succeeding H. J. Putnam. Mr. Cuttle was assistant manager to the late Mr. D. G. Thomson, taking over the management on Mr. Thomson's death last autumn.

The Madeira, building at the Chicago yard of the American Ship Building Co. for the Minnesota Steamship Co. of Cleveland, and which was launched a few days ago, will be ready for service on the opening of navigation. Her dimensions are 436 feet keel, 450 feet over all, 50 feet beam and 28½ feet molded depth. She will carry about 7,500 gross tons on a draught of 18 feet.

It is announced from Detroit that Capt. J. B. Millen has withdrawn from the firm of Parker & Millen, with which he has been connected for about twenty years, and has disposed of his interests in the various enterprises conducted by that firm. Capt. Millen's stock was purchased by A. A. Parker, B. W. Parker, John Pridgeon, Jr., Charles F. Bielman and L. C. Waldo, manager of the Northwestern Transportation Co.

In view of a very large increase in business during the past and pros-



TEN-INCH PLATE AND EARTHWORKS TO COVER 500 MEN.

FIFTY TONS OF EARTH SUPPORTING 9-INCH ARMOR PLATE.

NINETY-FIVE POUNDS GUNCOTTON IN SHELL FIRED AT BY A 6-POUNDR ARMOR PIERCING BALL AT 2400 FEET MUZZLE VELOCITY.

EFFECT OF ONE ROUND FROM GATHMANN GUN.

AFTER FIRING ONE ROUND.

SAME AS ABOVE, BUT ANOTHER SHELL.

show that it is not only safe but is the most efficient and destructive shell for artillery that is known?" asked Senator Hanna.

"As I know anything about it, that is the case," was the reply, and the constructor added that he considered the fuse entirely safe for use either on land or deck in the firing of high explosives.

So long, therefore, as Krupp's armor gives no protection at all against guns built on the Gathmann system, it is doubtful if congress will violate true business principles and spend millions for the army and navy that are not invested in harmony with science.

CONVENTION OF MASTER PILOTS.

The National Association of Master Pilots is in session at the Riggs House at Washington, D. C. The annual convention will extend over several days, and the delegates, in addition to considering the reports of the various officers and standing committees and electing their successors for the ensuing year, will discuss certain measures pending in congress relative to shipping. An unusual number of measures of this character have been presented at the present session of congress and especial interest therefore attaches to the present gathering of the pilots. It is a foregone conclusion that the convention will pass resolutions endorsing the bills prohibiting the towing of rafts on the Pacific, and it is quite likely that it will also seek ways and means to abolish the smoke nuisance, which is making navigation in New York harbor very dangerous. Grand Captain W. S. Durkee of Boston is presiding over the sessions and most of the other national officers are also in attendance.

The Nickel Plate road is the peoples' route and the road that gives best service at the lowest rates. A peerless trio of through express trains daily, palace sleeping cars, unexcelled dining car service, elegant equipment, these are the synonyms of the Nickel Plate's success. 8, Feb. 6

pects of a still larger increase in 1900, important improvements are to be made at once on the Cleveland docks of the Cleveland & Buffalo Transit Co. Although these improvements will involve a very large expenditure, the company has just declared a 4 per cent dividend. During the Pan-American exposition, which will be held at Buffalo in 1901, the steamers City of Buffalo and City of Erie will double the route daily between Cleveland and Buffalo. They will arrive at 6 a. m. and depart at 8 p. m.

PIG IRON PRODUCTION.

All records are again broken in the official statistics of pig iron production for 1899 as prepared by General Manager Swank of the American Iron & Steel Association, Pittsburg. The figures show that 13,620,703 gross tons (2,240 pounds) of pig iron of all kinds was produced in the United States last year. While in 1898, the two half year periods showed a very close approximation in output, the returns for 1899 emphasize the opposite condition. In the first half of 1899 the production was 6,289,167 tons; in the second half, 7,331,536 tons, or an increase of more than 1,000,000 tons. The output last year exceeded that of 1898 (11,773,934 tons) by 1,846,769 tons, or 15.7 per cent; while the output of 1898 exceeded that of 1897 by very nearly 22 per cent. Production during the past three years was as follows:

Periods.	1899.	1898.	1897.
First half	6,289,167	5,869,703	4,403,476
Second half	7,331,536	5,904,231	5,249,204
Total	13,620,703	11,773,934	9,652,680

Capt. Chester Harding, United States engineer at Grand Rapids, Mich., advertises elsewhere in this issue for proposals for the extension and repair of piers at White Lake, Mich.

PLANS FOR GAS ENGINES.

HOW WORKING DRAWINGS MAY BE HAD BY MACHINE SHOPS WISHING TO BUILD INTERNAL-COMBUSTION MOTORS—THE BUSINESS OF GIDDINGS & STEVENS.

The gas engine illustrated herewith represents very closely the standard practice of gas engine builders of the country who have brought out new designs and patterns within the past two or three years. It is the design of Messrs. Giddings & Stevens, mechanical engineers of Rockford, Ill., who make and sell working drawings. Messrs. Giddings & Stevens have also been engaged for a long time past in making and selling plans of steam engines and have orders in hand now for twelve sizes, complete, of Corliss engines up to 500 horse power for a Pennsylvania manufacturer. Their patrons include a great number of engine builders in different parts of the country who find it more economical to purchase drawings than to maintain an engineering and draughting department.

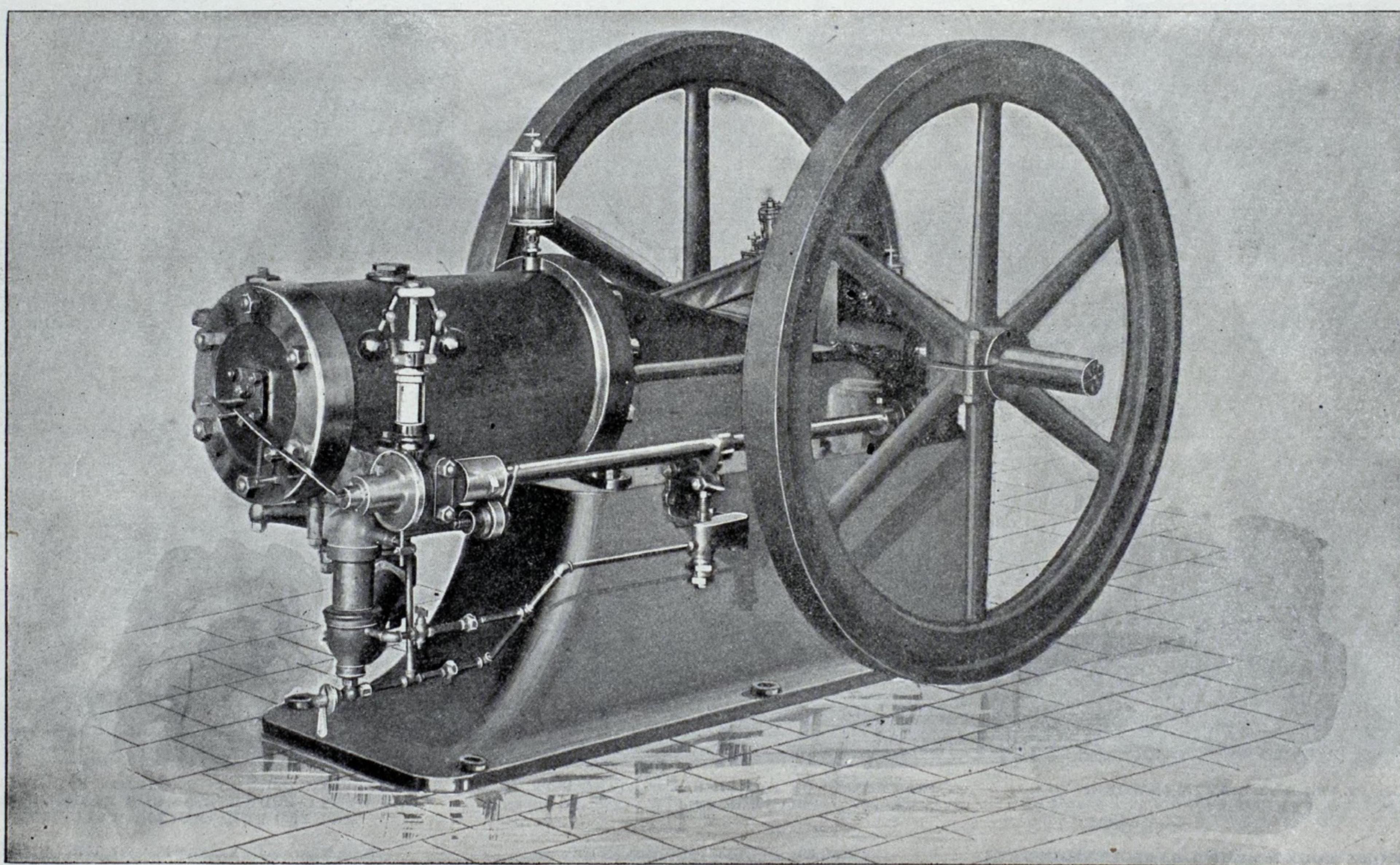
The engine shown herewith is built on the four-cycle principle, the smaller sizes having the bed and cylinder cast in one piece for cheapness of construction, the larger sizes having cylinder and bed separate, and all can be bored in an ordinary lathe having sufficient length and swing. Of planing work there is very little, simply the sub-base and bed joint in the larger sizes and the surface to which the exhaust chamber bolts; this chamber, together with the cylinder head and cylinder have ample water-jacket space, with the pipe connection so located that the circulating water first comes in contact with the hottest parts, namely valve chamber and cylinder head. The valve gear and governor, together with the igniter and gasoline pump, are all operated by the simple spiral-gear driven side shaft, the brackets for which are cast on the bed and cylinder, the boxes and caps for same being babbitted with the shaft in position, thus avoid-

the matter of obtaining good regulation. The gasoline pump is driven by a cam on the side shaft, the pump chamber being provided with a partition and outlet for an overflow pipe, which serves to maintain a constant head or pressure for feeding the supply valve. Means are also provided to operate this pump, before starting the engine, by a short lever extended into a handle. As the overflow pipe in this pump is of ample size, there is no danger or even a possibility of an overflow or the escape of gasoline vapor which might prove dangerous, and as a result of this safeguard the insurance companies admit this engine into buildings without extra risks or premiums, as there is no chance of escape of gasoline vapor and no open flame or torch to ignite the same.

The igniter on these engines is very simple and reliable, and is preferably operated by a small magneto, driven by the engine, or some adjacent shaft. It was made recently by the designers of this engine to furnish to the trade, together with special alloy igniter points, which with the magneto have been known to run twelve or fourteen months without any expense whatever. No batteries or spark coil are required for starting.

In a southern city an entire new works is being driven with an 8 H. P. engine of this design, and belting direct from the fly wheel of engine to a dynamo, drives both arc and incandescent lights for lighting the shops. Even when the heavy machine tools are at work in this plant, it is impossible to notice variation of any kind in the lights due to the change of load on the engine.

Complete sets of working drawings from which to manufacture these engines and also sample sets of castings may be obtained from Messrs. Giddings & Stevens. They are prepared to furnish this design in sizes from 2 to 50 H. P.; also four sizes of upright engines from 1 to 6 H. P. adapted to both marine and stationary uses. The successful experience of several parties who are building engines from the Giddings & Stevens designs and drawings enables them to insure their customers a successful



TYPE OF GAS ENGINE—GIDDINGS & STEVENS, ROCKFORD, ILL.

ing the necessity of any planing on them; these boxes, together with those for the main shaft, are provided with tapered dove-tailed recesses, cast in both box and cap to insure the shrinkage of the babbitt holding it firmly to the box, a T mandrel centering in the cylinder or recess bored in the head of the frame or bed, being used to babbitt the main shaft boxes, this mandrel being provided with collars, properly located, so as to establish the length of the babbitted surface in the box and also form a babbitt shoulder at each end of the box for the crank and gear to work against. The cored recesses for holding the babbitt above referred to have the small end of the tapered recess in the middle of the boxes, and placed $\frac{1}{2}$ inch apart and tapering toward the outer end of the box. These recesses are cut under or dove-tailed, so that when genuine babbitt is poured in at the proper heat, into clean recesses, the shrinkage of the same against the taper of these recesses has never failed to make a solid and durable box, even when used in the main boxes of Corliss engine shafts of 8 or 10 inches diameter.

The design and proportion of the main shaft bearings of this engine are worthy of a special notice. The illustration shows clearly the means by which the governor is driven—a simple pair of beveled gears, which avoids the necessity of a governor belt so apt to get to slipping or to run off; and this governor is used to throttle the mixture and give to the engine just as much of that mixture as is required for the impulse of each alternate revolution, in order to maintain a uniform speed under varying loads. It furnishes the simplest and most reliable means possible for obtaining a regulation within 2 per cent under extreme variations of load, thus admirably adapting the design for electric lighting purposes.

It will be noticed that the governor valve is placed between the inlet valve and the cylinder, thus reducing to the smallest possible amount a clearance between governor valve and cylinder, which greatly facilitates

working engine if the drawings are faithfully carried out with first-class workmanship and material. It is expected at a later date to publish test reports of this engine, showing economy, regulation and power developed, together with indicator cards taken during the test, showing the difference between the actual and indicated horse power.

LIFE SAVING DEVICES.

New devices for saving life at sea continue to appear. One of the latest is a life saving collar, recently devised by a Belgian inventor. The collar is made up of separate air-tight sections so joined as to form a pliable whole, and it can be fitted to the neck of a child or an adult with equal facility. Its buoyancy is such that it will readily keep afloat a body weighing 200 pounds.

H. Wrench Nash has patented in London what is known as the Victorian life saving apparatus. It consists of a collapsible canvas-covered cylinder, 7 feet long, which may be expanded by means of screws working on the bamboo rods at the side. At either end is an air-tight metal compartment, which serves to keep the apparatus afloat. In the center is a watertight compartment of India rubber. Obviously there is scarcely a possibility of the craft swamping in the event of a storm or heavy weather. Paddles are fastened to the cylinder and may be detached for use. Concentrated food of all kinds, fresh water and spirits may be stored away in safety in the watertight compartments inserted in the metal ends.

The 1900 calendar issued by the Nickel Plate road, will be mailed to anyone sending address to the general passenger agent, Cleveland, Ohio. 11, Feb. 1.

MARSITE, A HIGH EXPLOSIVE.

TESTS UNDER THE DIRECTION OF THE NAVY BUREAU OF ORDNANCE—A 10-INCH WIRE-WOUND GUN FROM WHICH GREAT THINGS ARE EXPECTED.

WASHINGTON OFFICE MARINE REVIEW, 1345 PENNSYLVANIA AVE.,
WASHINGTON, Jan. 24, 1900.

The latest high explosive to claim the attention of the United States government is the invention of Mr. Hathaway of Wellsboro, Pa., and is known as marsite. The ordnance bureau of the navy, under the supervision of Admiral O'Neil, has begun investigation of the material, and preliminary tests have been made under the personal direction of Commander Joseph Eaton of the navy. Results so far obtained are said to have been highly favorable. The ideal explosive must be one in which the elements of safety resulting from low pressure and great velocity are in delicate combination. This will be readily understood to encompass a difficult chemical proposition, yet in marsite the inventor claims to have solved the problem. The discovery is supposed to be a nitrate compound, although its composition is the secret of its inventor. In appearance it resembles dark colored clay, and Mr. Hathaway satisfactorily demonstrated to Commander Eaton that it is probably the highest safe explosive in the world to handle.

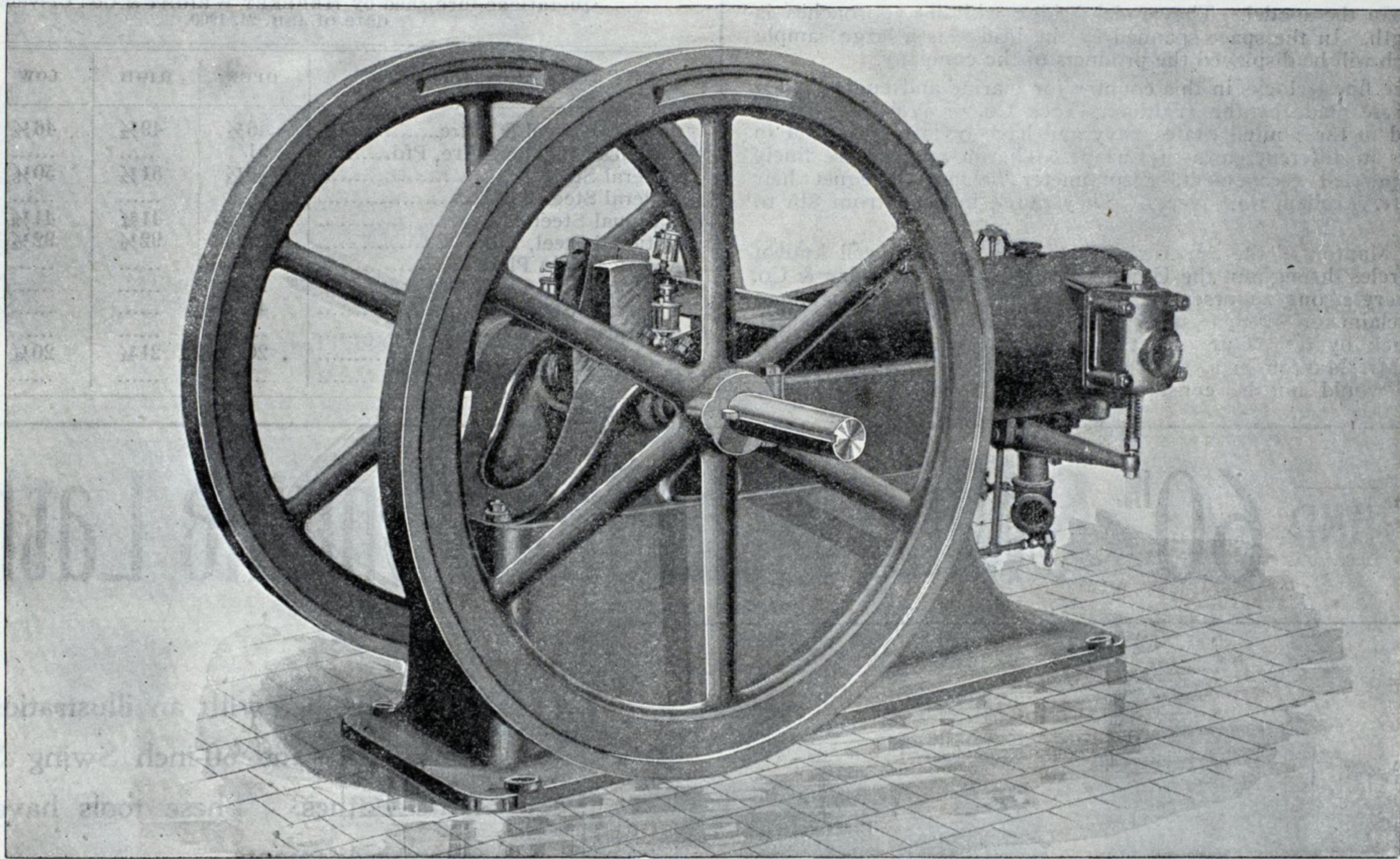
The chief claim of marsite for recognition as approaching closely the ideal conditions are the ease in handling and its terrific power when exploded. At a recent test at Lowell, Mass., the inventor, in the presence of Commander Eaton and other official witnesses, took a lump of the compound and proceeded to pound it with a hammer, and then to file it into small pieces. Although producing a great heat in combination with shock, the explosive showed not the slightest trace of its real character.

ment is looking forward to this test with considerable interest. The peculiarity of the new Brown gun over its predecessors and other wire-wound guns lies in the formation of the part intermediate between the inner tube which carries the riflings and the windings of wire which give to other wire-wound guns almost all of their strength. In the earlier Brown guns and in all those made abroad, this part of the gun is made of steel staves laid together like the staves of a barrel. This method, while giving longitudinal stiffness, offers no resistance to a bursting strain. In the new gun this part of the barrel is formed of sheets of rolled steel, each the full length of the gun, but comparatively narrow. There are 282 of them. When these sheets are pressed against the bore tube by the great tension under which the wire winding is put over them, the frictional resistance of their surfaces as they lie one upon another is equal to about 95 per cent of their structural strength, so that this part of the barrel is almost as strong as if it were made of solid steel of the finest character. These plates are made of rolled steel of high grade, each less than $\frac{1}{4}$ inch in thickness. The gun is 37½ feet long and weighs 30 tons. It is expected to fire a 600-pound projectile with a charge of 300 pounds of smokeless powder and to develop a muzzle energy of 3,000 feet a second and an energy of 38,000 foot-tons. It is not believed that any armor plate ever made will be able to stop a 10-inch projectile sent forth at such a speed. The gun was built through an appropriation of \$35,000 made by congress for that purpose. The wire for winding it is square instead of round, and there is about seventy-five miles of it in the gun.

LARGE FOREIGN BUSINESS IN PNEUMATIC TOOLS.

Summing up foreign operations of the Standard Pneumatic Tool Co., Marquette building, Chicago, Mr. H. B. Holmes of that company says:

"Our mechanical superintendent, Mr. Henry James Kimball, after



TYPE OF GAS ENGINE—GIDDINGS & STEVENS, ROCKFORD, ILL.

The demonstration showed that it was impossible to explode it by concussion. Then the fire test was given. In this experiment it merely sizzled for a moment under a direct flame and the fire died out, showing that two crucial tests proved its safety. Mr. Hathaway explained that in order to explode it the combined forces of percussion and concussion must be employed. These were secured from an electric battery, and its explosive power was shown by placing a quantity of it in a 4-inch shell, which was put in an excavation in the ground. Over the hole was placed a screen of steel an inch thick, above which a wooden structure was built. When the current was turned on a terrific explosion occurred, which tore a hole in the steel screen and burst the shell into thousands of fragments. When placed between cakes of ice to demonstrate that it is not affected by cold the explosion tore the ice to pieces and cast fragments high into the air. With an explosive of this character the art of artillery warfare assumes a new phase.

The safety in handling marsite is also an item of importance, and the ability to fire a shell charged with it from a rifle with the initial velocity 2,000 feet per second makes it a most valuable discovery. Being insensible alike to heat and cold it may be utilized in any climate and exposed to almost any conditions of fire and shock. Admiral O'Neil expects to make further tests in order to determine its stability and keeping qualities and the inventor is sanguine of results equally satisfactory with those which were the outcome of the recent exhibition. Should it prove to be all that its discoverer claims for it, experts say that its value to heavy ordnance can scarcely be estimated.

Preparations are being made at the Sandy Hook proving grounds to test the new 10-inch wire wound gun which has been built for government tests by the Brown Segmental Tube Wire Gun Co. The govern-

an absence of three months, has just returned from an extensive European tour. While in England he established works at Chippenham, near London, for the manufacture of the 'Little Giant' pneumatic tools for the European trade, and installed therein \$50,000 worth of the most improved machinery and labor-saving appliances, and before his departure for this country the plant was in full operation and turning out tools in large numbers. He says that the opposition to the use of pneumatic tools by labor organizations on the other side of the Atlantic, on account of their labor-saving qualities, is gradually dying out, and everywhere progressive concerns are installing machines of this description. In this connection it may be noted that our export business has increased with remarkable rapidity during the past year, and 'Little Giant' drills, hammers and boring machines are being adopted by some of the largest foundries, ship yards, machine shops, railroad and boiler works and other manufactories in Great Britain, France, Germany, Italy, Sweden and Russia. We recently received an order for \$25,000 worth of pneumatic tools from a machinery dealer in Holland, and other orders aggregating a like amount from the other countries referred to. Our domestic business is also increasing, particularly with the railroads, and if the demand for the 'Little Giant' tools continues we will again be compelled to enlarge our works."

A contract has been placed by the Allan line with William Denny & Bros., Dumbarton, Scotland, for a twin screw steamer of 10,000 tons gross register. The vessel will be a sister ship of the Bavarian, but will have greater passenger accommodations and a speed of 17 knots. Another speedy vessel for the Allan line, the Tunisian, is nearing completion on the Clyde, and the Corinthian, a vessel of 6,000 or 7,000 gross tons, is under construction at Belfast.

TRADE NOTES.

Mr. Arthur W. Chesterton, commodore of the Winthrop Yacht Club of Boston, is among the most active members of that organization, and will undoubtedly look after its interests in a very thorough manner during the coming year.

The Crumlish Forge Co., Buffalo, N. Y., is full of work and much behind with its orders. The unprecedented activity in ship building has proved most fortunate for this firm. During 1899 over 50 per cent. of its shipments of portable forges were for ship yards; and thus in 1900 all its orders have been for ship yards, including several for foreign yards.

The following notice has just been issued by the American Steam Gauge Co.: "Our postoffice address, which is now 34, 36, 38 Chardon street, Boston, will on Feb. 1, 1900, be changed to corner of Boylston and Bismarck streets, Jamaica Plain, Boston, Mass. All express packages should be consigned to our city sales office, 188 Franklin street, Boston."

The handsome calendar issued by Wilson & Silsby, sail makers, Rowe's wharf, Boston, Mass., is one of the last to come to hand, but it is none the less acceptable for that reason. It gives in convenient form the stages of water at the Boston navy yard and there is a table of difference which makes it easy to make computations for other ports on the Massachusetts coast.

Mr. Edward F. Cole, lawyer, of Waterbury, Conn., writing to Cole & Kuhls of Brooklyn, N. Y., manufacturers of deck seam paint and composition, says: "Last May I received an invoice from you of your Elastic seam composition, which I used on my yacht Woodmansee during the season. I think it a very excellent article and I am pleased to say that it gave entire satisfaction."

The John A. Roebling's Sons Co. of Trenton, N. J., has shipped to the Paris exposition a perfect model in wire of the Brooklyn bridge. Every cable and wire that was used in the construction of the big bridge is reproduced in the model. The model bridge with its approaches is 28 feet in length. In the space spanned by the bridge is a large sample board on which will be displayed the products of the company.

Among the finest clocks in this country for marine and engine room service are those made by the Waltham Clock Co. of Waltham, Mass. They are used in the United States navy and have of late been sold in large numbers in different parts of Europe. The movements are finely made, have jeweled escapement, chronometer balance, Breguet hair spring, and are excellent time pieces. They range in price from \$15 to \$33.50.

Frank S. Manton of the American Ship Windlass Co., well known in shipping circles throughout the United States, gives to Beaudry & Co. of Boston a very strong endorsement of their Champion power hammer, the foremost claim for which is superior elasticity and perfect control of the blow struck by it. "Our object in displacing other hammers by yours," says Mr. Manton in a letter to Beaudry & Co., "was to get a hammer that would not be constantly breaking down and would be

adapted to small and heavy work without changes of the hammer in use. Other hammers that we have used have had springs or hammer helvets, and of course without adjusting, it brought a great strain on the springs or helvets, which is avoided in your hammer, and we are enabled to change from light to heavy work without spending time for adjusting the hammer every time." Among other concerns well known in marine lines that are using these hammers are the Geo. Lawley & Sons Corporation of South Boston, the Massachusetts Institute of Technology, and the Boston & Lockport Block Co.

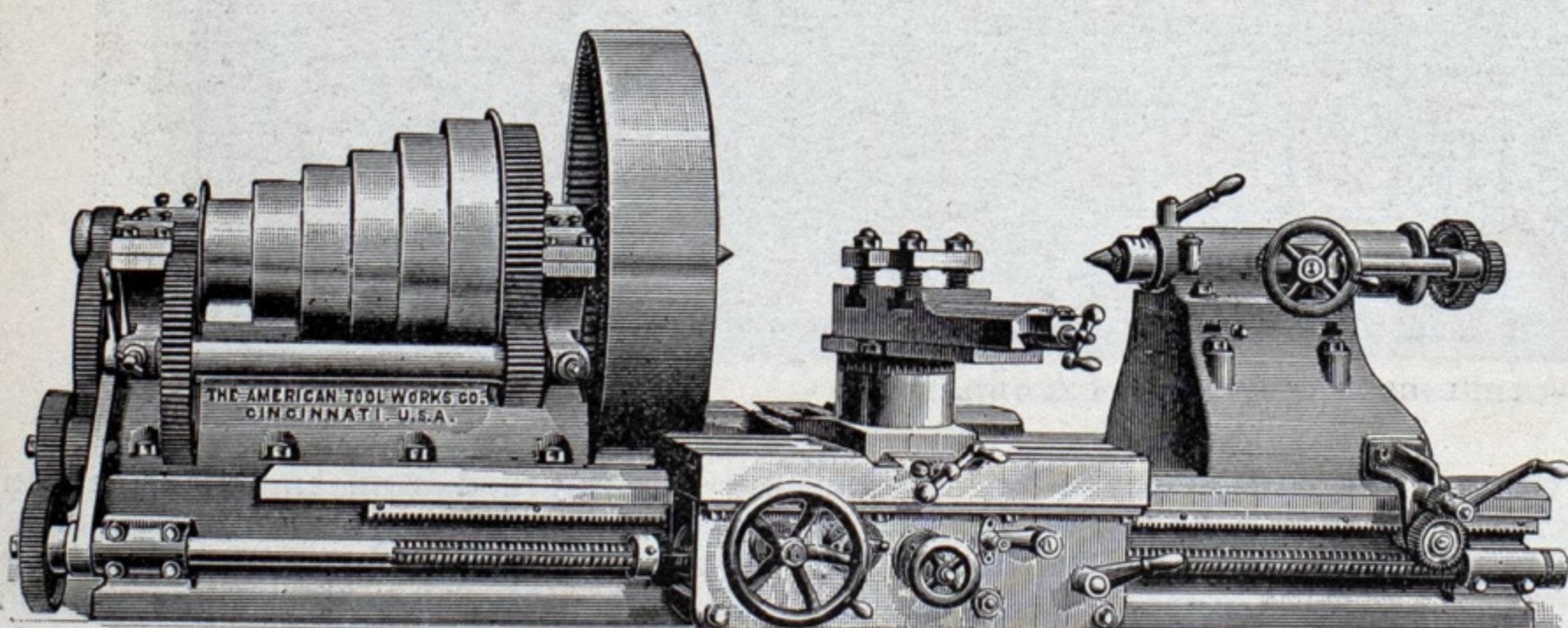
About Feb. 1 the Geo. W. Knowlton Rubber Co. of Boston will move to enlarged quarters at No. 1 Custom House street, corner of Broad. With an abundance of floor space in its new location this company will carry a much larger line than in the past, of steam and water hose, sheet packing and all kinds of mechanical rubber goods. Improved facilities will be provided for the finishing process in the manufacture of their well-known Knowlton moulded ring and spiral packings, as well as their special water packing, which will hereafter be known as Geo. W. Knowlton's Manila pump packing.

D. T. Helm of Chicago, who has been with W. M. Egan in vessel brokerage and insurance business for twenty-eight years past, will shortly leave Chicago for Duluth, where he will take up a similar business. Mr. Helm severs entirely his connection with the Chicago office. He goes to Duluth with such assurances as will undoubtedly result in his new undertaking being made permanent at once, and he will have the advantage of a thorough knowledge of the business as well as an acquaintance extending to every vessel owner on the lakes. He has a host of friends who are wishing him every success.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.
Quotations furnished by HERBERT WRIGHT & CO., Cleveland,
date of Jan. 24, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	46½	49½	46½	49
American Steel & Wire, Pfd.....	91	.....	.....	91
Federal Steel	50½	51½	50½	51½
Federal Steel, Pfd.....	.....	.....	.....	.....
National Steel	41¼	41¾	41½	41½
National Steel, Pfd.....	92½	92½	92½	92½
American Tin Plate	29	.....	.....	29
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	42	.....	.....	42
American Steel Hoop, Pfd.....	.....	.....	.....	.....
Republic Iron & Steel	20¼	21¾	20¼	21½
Republic Iron & Steel, Pfd .....	.....	.....	.....	.....

52 IN. AND 60 IN. SWING STANDARD ENGINE LATHES



SIXTY-INCH SWING STANDARD ENGINE LATHE.

WE show herewith an illustration of our 52-inch and 60-inch Swing Standard Engine Lathes. These tools have all the latest improvements.

We are also builders of a complete line of high-grade tools for Machine Shop Equipment.

The American ToolWorks Company,
WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway,
Geo. Place, Agent.

NEW ORLEANS: The Fairbanks Co.

CHICAGO STORE: 68-70 South Canal Street.

PHILADELPHIA: The Fairbanks Co.

CLEVELAND: The Strong, Carlisle & Hammond Co.

BOSTON STORE: 36 Federal Street.

BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.

DENVER AND SALT LAKE CITY: The Mine & Smelter Supply Co.

LONDON: Alfred Herbert, Ltd., 7 Leonard St., Finsbury, E. C.

DUSSELDORF: de Fries & Co., Act. Ges., Graf Adolf Strasse, 83-87.

ANTWERP: Nyssens Frères, 33 Rue des Peignes.

BERLIN: de Fries & Co., Act. Ges., Kloster Strasse, 13-15.

PARIS: Roux Frères & Cie., 54 Boulevard du Temple.

MOSCOW: Alfred Stucken.

NEW USES EVERY DAY FOR PNEUMATIC TOOLS.

"We are finding new uses almost every day in all branches of manufacture," says one of the officers of the Chicago Pneumatic Tool Co. "The great flexibility of air as motive power and the ease with which it can be applied to all work, especially in places that seem inaccessible, and the facility with which this power is distributed to any desired point, have given it a commanding place among the best labor-saving inventions. Our increase of sales with the opening of 1900 is very large, the tools going to all parts of the world and into every variety of uses. We are now receiving returns from a general letter to all our customers and the flattering responses show that the tools and appliances have met with the highest and continued favor everywhere. As new demands arise, new tools are produced to meet such demand and the high quality of material and workmanship gives these tools a standard of excellence which is recognized the world over. Among later tools, the Boyer long-stroke riveting hammers are found to meet the requirements on all classes of riveting, particularly on ship and boiler work, where the best results are attained with a great saving in labor and expense. We are ready to furnish catalogues and full information at all times and will soon issue a new series of catalogues, showing our full line of pneumatic tools and appliances."

Officers have just been chosen by the American Society of Naval Engineers as follows: President, Commander Harry Webster (re-elected); secretary-treasurer, Lieut. Commander G. S. Willits (re-elected); council, Lieut. Commander F. H. Bailey, Lieut. B. C. Bryan and Lieut. R. L. Griffin. The financial report of the organization was a most satisfactory one, and the statement of the secretary shows a gratifying increase in membership, despite the operations of the personnel bill. The competition during the past year for a prize essay was won by Prof. W. F. Durand, the second prize being awarded to B. C. Ball.

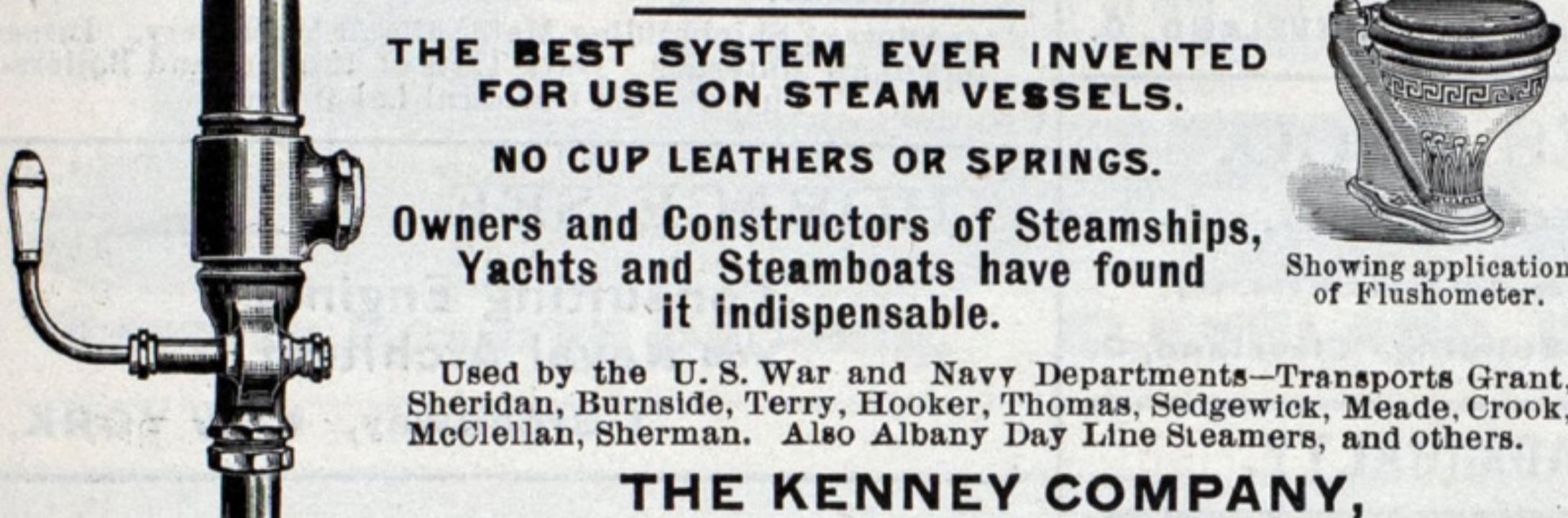
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THE BEST SYSTEM EVER INVENTED
FOR USE ON STEAM VESSELS.

NO CUP LEATHERS OR SPRINGS.

Owners and Constructors of Steamships,
Yachts and Steamboats have found
it indispensable.



Used by the U.S. War and Navy Departments—Transports Grant, Sheridan, Burnsides, Terry, Hooker, Thomas, Sedgewick, Meade, Crook, McClellan, Sherman. Also Albany Day Line Steamers, and others.

THE KENNEY COMPANY,
Catalogue? 72 to 74 Trinity Place, NEW YORK.

[Patented.]

INSPECTION OF ARMOR.

An inspection of the Krupp armor plate, which the Carnegie Steel Co. is manufacturing at its plant at Pittsburg for use in the construction of the Russian battleship Retvizan, now building at the yard of the Wm. Cramp & Sons Co., Philadelphia, was made last week by a party of officials, which included Col. A. Bryuk, minister of the Russian navy and chief of the board of inspection of armor plate, and two lieutenants. They inspected the method of manufacture in all its details and expressed themselves as very well pleased both with the work being done by the Carnegie company and by the Cramps. The Russian armor contract aggregates 2,730 tons and will represent an expenditure of something like \$1,500,000.

There has just been issued in pamphlet form the rules of the competition for the best life saving device in case of disaster at sea to be held at the Paris exposition for the Anthony Pollok memorial prize. Secretary William Ker requests that prospective competitors forward detailed plans and specifications of apparatus for the prize competition to John H. McGibbons, director of exploitation, Paris exposition commission, whose address is Equitable building, 120 Broadway, New York city. Small models may also be sent there and all should be marked plainly "Pollok Memorial Prize." If a decision as to the merits of apparatus cannot be reached by the committee, the competitors will be asked to send such additional matter as may be necessary, including larger models, and in certain cases, the apparatus itself.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 24, 1900. Sealed proposals for Extension and Repair of Piers at White Lake, Mich., will be received here until 3 p. m., February 28, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Feb. 15.

SEALED PROPOSALS will be received at the office of the Light-house Engineer, Buffalo, N. Y., until 12 o'clock m., March 5, 1900, and then opened, for furnishing the labor and materials necessary for completely constructing and erecting a steel frame keepers' dwelling, and tower with lantern and fog-signal house at entrance to Maumee Bay, Ohio, in accordance with specifications copies of which, with blank proposals and other information, may be had upon application to T. W. Symons, Major, Corps of Engineers, U. S. A. Feb. 8.

CAPT. GEO. A. SIMPSON, Expert Compass Adjuster,

10 YEARS EXPERIENCE.
Yearly Contracts Solicited. Nautical Instruments Repaired.
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PNEUMATIC TOOLS FOR ALL KINDS ACC. OF WORK

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Telephones Main 2754, 2770 and 3541.

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No. 811 NEW ENGLAND BUILDING.

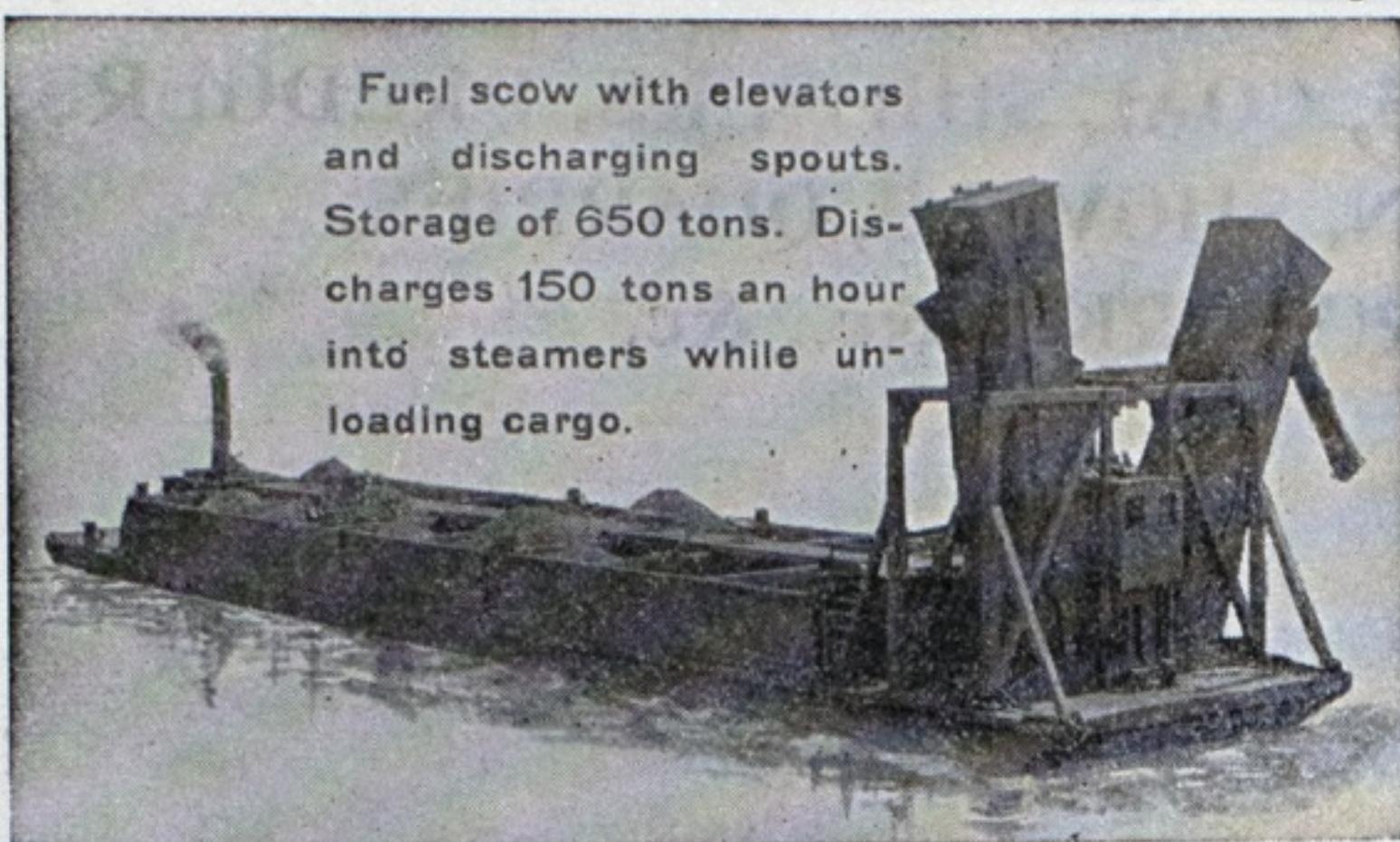
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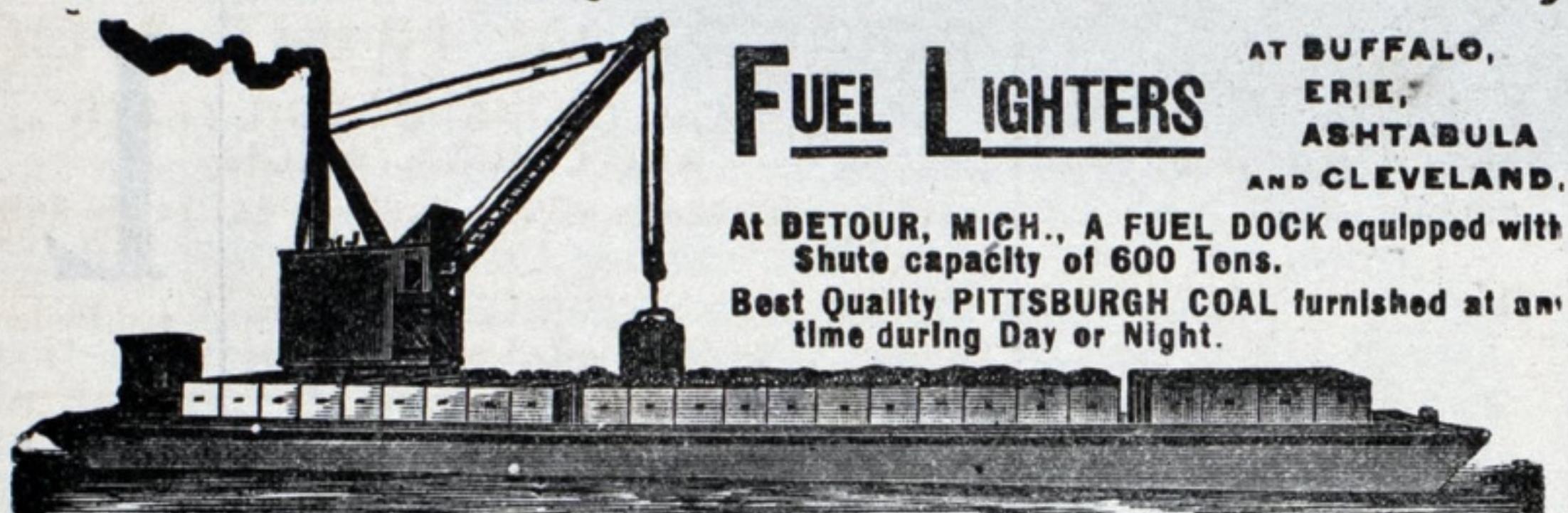
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4 STEAM PUMPS, 10 JACKS, 3 HAWSERS.

1 COAL AND ORE PUMP 3-12 INCH ROTARY. 1-14 INCH WORTHINGTON.

DIVING RIGS AND DIVERS ABOARD AT ALL TIMES.

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S	M	T	W	T	F	S
...	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
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28	29	30	31
...

TELEGRAPH
PARKER & MILLEN, MICH.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 2, 1900. Sealed proposals for Extension and Repair of Pier at South Haven, Mich., will be received here until 3 p. m., February 1, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Jan. 25.

FOR SALE—Steam Barge and Consort.

Steam barge classes A 1, carries 1,000 tons of coal, 33,000 bushels of corn or wheat, 900 tons of ore, or 600,000 feet of lumber on 12½ to 13 feet draught.

Tow barge classes A 2 and on 12½ to 13 feet of water carries 32,000 bushels of corn or wheat and 650,000 to 750,000 feet of lumber.

JOHN C. SPRY, 707 Chamber of Commerce, Chicago, Ill. tf

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Position as chief engineer of large modern steamer, or line of steamers, where highest efficiency is desired, by a steam and mechanical engineer of twenty years' actual practical experience in constructing and operating several of the largest steam plants in the country. At present chief engineer of city pumping station which cost two million dollars and has operating force of 125 men. Recommendations from best mechanical engineers and highest grade marine license. Address Engineer, care the Marine Review Pub. Co., Cleveland.

Feb. 1.

WANTED.

150 light direct-connected upright Engine and Dynamo, suitable for boat. Address The Cleveland Box Co., Cleveland, O.

Jan. 25.

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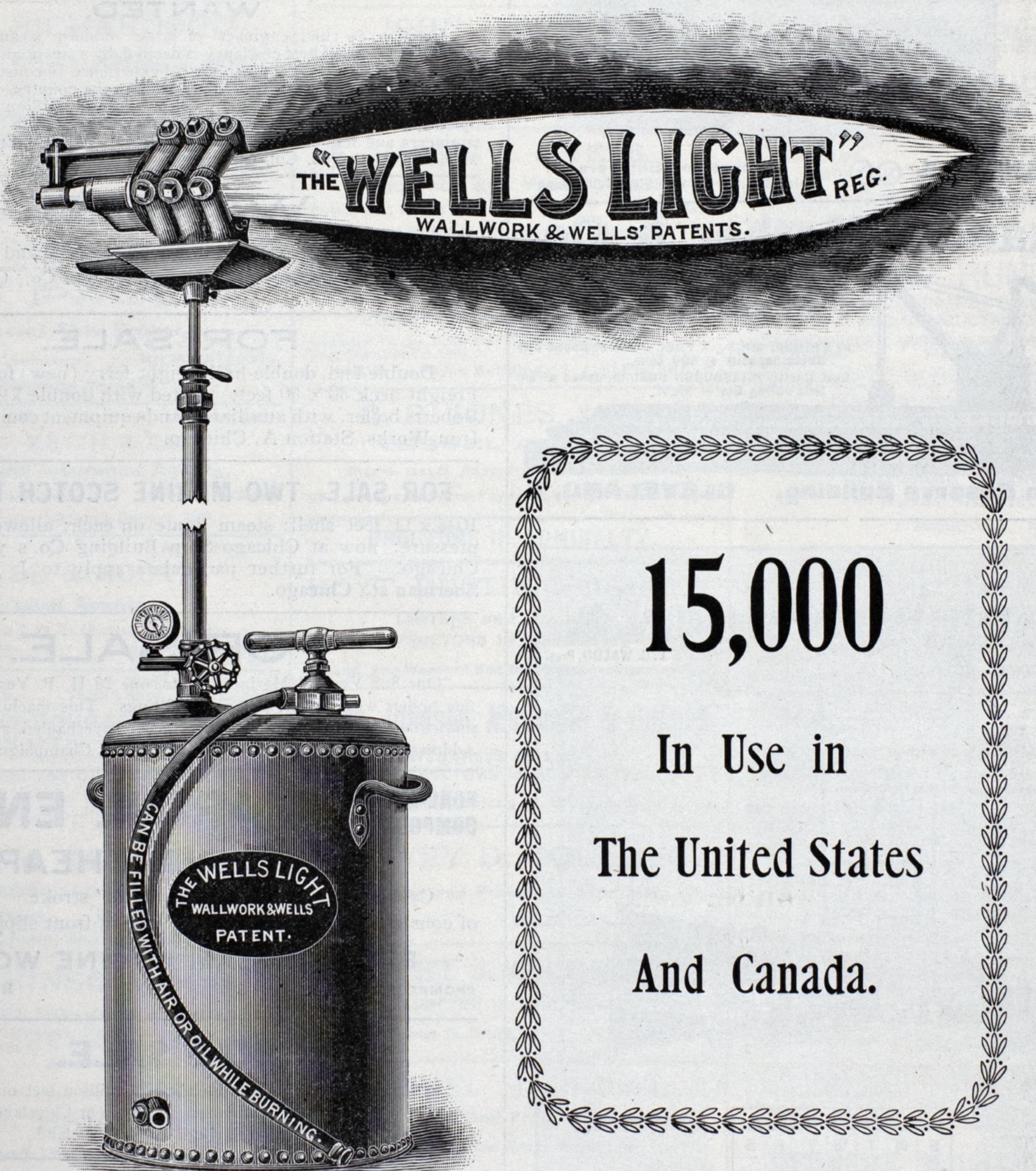
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